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ADDRESS AT THE ANNUAL GENERAL MEETING
of the Society held on 20 June 1932, by the President

ADMIRAL SIR WILLIAM GOODENOUGH, G.C.B.

THE Session of 1931–32 was marked by the Society's House being honoured by a visit from Their Majesties the King and Queen. Their Majesties were, I am bold enough to say, interested in all they saw and remained in the building between one and a half and two hours. They permitted me to speak of their interest, which Their Majesties subsequently showed by a present of two very beautiful miniature globes which stand in the Map Room. This visit was a great encouragement to us, and I am happy to inform the Fellows of the Society that it has been followed by a further mark of their Majesties' approval, and that with the full approval of the King, our Royal Patron, Her Majesty the Queen has consented also to extend her patronage to the Society.

The Report of the Council for the year 1931 is with you. The only item in it that I will speak of at this moment is the fact that the number of Fellows has somewhat declined. There can be no doubt that this was caused by the financial uncertainties of last year, and though not unnaturally the Council are obliged to be somewhat concerned they are not alarmed, for I am glad to be able to say that the candidates who have come forward in the first half of this year show a good desire on the part of many people to become Fellows of this Society. And I venture to call the attention of all, whether Fellows or not, to the new Bye-Laws passed at a Special General Meeting of which you have heard, whereby certain easements of contribution are made. We have been relieved by the benefaction of the late Mr. Vallentin: it is hoped that a portion of his bequest will shortly be paid to our account, but these are matters which more properly belong to a later stage of this meeting for the consideration of the Fellows themselves.

A second year of occupation of our new buildings has shown how much we owe to those who initiated and carried out that project. Not only have we been able to display many of the beautiful things in our collection to much greater advantage, but the feeling of corporate fellowship engendered by living in our own building has, I feel sure, repaid both the money expended and the labour which has gone with it. One thing which is of great importance is that we have been able to have extra Meetings without either the expense of hiring a hall or of

the uncertainty of being able to obtain one. And I should like to call attention to the cinematograph films which have been shown from time to time and which will always form a feature of our sessional programme. The equipment for this was provided from a bequest left by the late Mr. Maudslay.

May I also call attention to the very agreeable present which has been made by Miss Tucker of the carpet on which we stand. Other gifts will be found recounted in the Council's Report, and although there is nothing of greatly outstanding value there are many things of interest. I call attention to the seismograph, an instrument for measuring the depth of ice, which is owned jointly by this Society and the Royal Society. It is being lent, with the consent of the Royal Society, to an expedition which is going this year to Iceland; and I hope that in future years the instrument will be of the greatest possible use in determining certain problems that such men as the late Dr. Wegener and many others have for long had in mind.

You will remember I spoke of appointing a Sub-Committee to inquire into aerial navigation and survey. It was found that the work of instruction could only be carried out in the evening, and that therefore it was not possible for us to have classes here, but the Society may be assured that every resource which we have here, both of instruments and knowledge, is at the disposal of those who work in this most important branch of geography. The work of instruction in field survey continues. Two members of the expedition which left last Saturday for Brazil were persuaded by me to take a short course of instruction under Mr. Reeves, so that whatever else they bring back we shall have something that will be of actual geographical importance and interest.

It was a great satisfaction to all to notice the increased attendance at the afternoon lectures, and it is hoped to widen the scientific scope of those afternoons. You have heard a short account of those journeys and that work for which Medals and Awards have been granted. There have been others. Mr. Philby's journey across the Rub' al Khali will give thought for much discussion. Whether Wabar is or is not in any way connected with the land of Ophir is a matter which will continue to be discussed for many years.

Sir Aurel Stein now, I am happy to say, after many vicissitudes has continued his researches in Central Asia and Persia with the pertinacity creditable to a Gold Medallist of this Society. Those who have had the privilege, as I am glad to say I have, of talking to him over his various journeys since he last left England, will find that there are plenty more places for explorers to go to in the future and bring back news and descriptions of. Captain Kingdon Ward has found new fields. Sir Douglas Mawson and Dr. Stanley Kemp have both carried out work of the greatest possible importance in the Antarctic; and it is of very great interest in this connection to hear what is being, if not actually done, at least very much discussed, namely, that all nations who have had explorers in the Antarctic should come together and arrive at conclusions on the nomenclature of the places visited and charted. Colonel Schomberg and Professor Dainelli have also given us descriptions of their geographical and mountaineering explorations. To many of these, we are glad to say, we have been able to give assistance in the loan of instruments, and in all we have given encouragement and taken great interest, and I can assure the Society that next year the interest will not be lessened, and I already have in view no less than

eight lectures, from China to Peru. I shall probably refer to those lectures again later in the day, but I hope that Sir John Hope Simpson himself will come and lecture to us on "The Chinese Floods: their Cause and Consequences." I heard only an hour ago that Prince Sixte of Bourbon Parma, who has made some fine journeys into the Sahara, will be here; and a gentleman well known both by family and inclination as a fine anthropologist will speak to us on the Polynesian islands. We have also a choice of two men, one an Englishman, Captain Humphreys and Count Xavier de Grunne, who are investigating the northern slopes of Ruwenzori.

The Society has to deplore the loss of many Fellows, and of others who, though not members of our Society, were associated with it. Of those not of our own nationality I would mention Dr. Wegener; Captain Cagni, who was with the Duke of the Abruzzi; General Ferrié, to whom geography owes an immense debt; and our great friend Georges Haardt. Of our immediate friends, Sir Maurice de Bunsen's name and memory is ever fresh: his genial personality, his immense knowledge of the world, combined with his entire simplicity of character, made his death a most grievous loss to us. I would like to mention here that his place as Foreign Secretary has been filled, much to the gratification of all, by Lord Howard of Penrith. Dr. Cuthbert Christy has fallen a victim to work to which he has devoted nearly all his life in tropical climates, and only last week we heard of the death by drowning of Professor Gregory, who has so often stood and explained in simple language the most intricate geological and geographical problems, and whom we had hoped to have been able to have heard again. Lord Stanley of Alderley, though a Fellow of more recent date, was the President of the Manchester Geographical Society, with which we are closely associated.

Fellows may remember that this time last year we heard that Oxford University were about to create a Chair of Geography and to appoint a Professor. That has now been done. It has been my privilege to see more than once the new Professor of Geography at Oxford, and when I tell you that one of the series of lectures which he is going to give next year is entitled "The Geography of Current Affairs," I think all will realize that here is a man who is prepared to inculcate and encourage a breadth of knowledge far beyond that of survey, cartography, and exploration, of all which we knew he was already a master.

There is one other matter I would refer to: that is the unveiling of the Shackleton Memorial. It is difficult to appreciate properly the rugged beauty of that memorial: it was accompanied by a fitting ceremony. The speeches that were made—one by a Past President and one by that greatest of all authorities on Polar travel, Dr. Mill—serve as models, and I have had personal experience of how far-reaching they have been. I hope to speak later in the day of our hopes that the niche on the north wall will not be left unoccupied. But I really do not know why I should say "later in the day." After all, such things bear repetition. Naturally there has been much discussion as to whose representation should stand in the niche on the north wall. Some have suggested Hanno; others Ptolemy, Ibn Battuta, and Francis Drake; but I believe, as I shall say again to-night, that when that empty niche is filled with the effigy of David Livingstone, those two figures will be an outward and visible sign of the

spirit of geographical research and exploration and the advance of humanity which actuates the movement of this Society.

Each year brings some fresh interest from the inexhaustible store that the study of geography provides. One could elaborate them in many addresses and many books: one thing occurs to me, one of which not unnaturally I have some personal experience, and that is how the study of what we profess in this building leads to a better appreciation of the government of what are known as subject-races. The fact that many distinguished Governors and Pro-Consuls have been, and are, Fellows of our Society is of great encouragement. Each section of the human race requires a different study, and yet even-handed justice governs all. The temptation to elaborate such themes is great, but one I will not fall to this afternoon, but I would ask to be allowed to put that before this assembly as last year I did—the distribution of population.

Once again it is the most pleasant duty of the President to offer, on behalf of the Council of the Society, their sincere gratitude for the work done by all branches of the staff. The Fellows of the Society will miss Mr. Swain, our late porter, who on the advice of his doctor retired from our service. The Council were glad to be able to assist him financially in his retirement, and we have with us, as his successor, a man who will, I know, devote himself to the interests of the Fellows of this Society. To all members of the staff, the Secretary, the Map Curator, Librarian, and all those who have worked under them, I offer, on behalf of the whole Society, our very sincere thanks.

And in conclusion may I say that scientifically and financially I believe the Society to be on sound foundations.

THE B.A.N.Z. ANTARCTIC RESEARCH EXPEDITION, 1929–31: *A paper read at the Evening Meeting of the Society on 7 March 1932, by Professor Debenham, on behalf of*

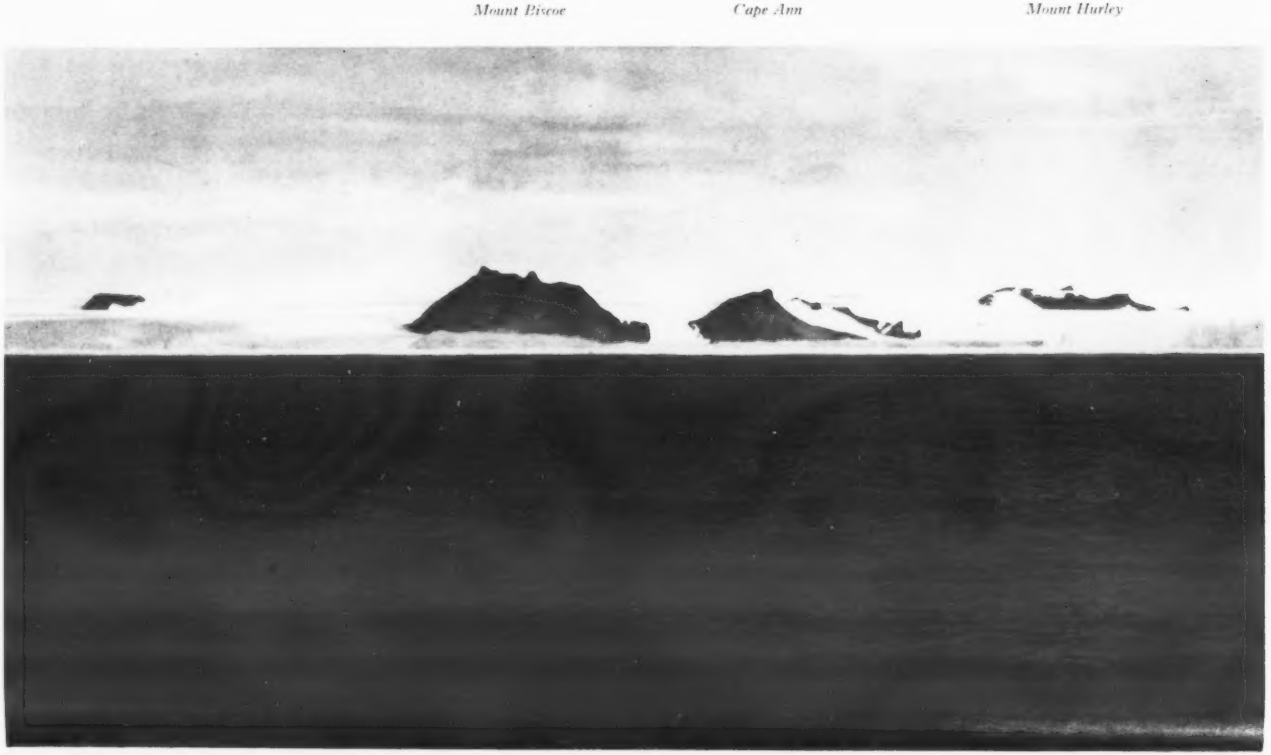
SIR DOUGLAS MAWSON

A GREAT Antarctic region lying southward of Australia is, by its geographical situation, a heritage for Australians. There a stupendous land mass lies nearer to the Commonwealth than the distance between the east and west coasts of our own Continent. For more than thirty years past Australians have taken an active interest in the exploration of these far southern regions, co-operating in several British enterprises which have contributed notably to the knowledge of them. Those earlier efforts to which I refer were centred on the neighbourhood of the Ross Sea, where there is opportunity for reaching high southern latitudes, and a favourable route for the attainment of the Pole itself. To Australians the most appealing feature of the Antarctic problem has, for long past, been the delineation of Antarctic lands in lower latitudes, where they approached most nearly to Australia itself, possibly offering increased opportunities for occupation and economic development and a closer relationship of the local scientific problems with those of our own land.

For several hundred years past geographers had rolled back the margin of a hypothetical southern continent until, having eliminated it from the ice-free seas, the mythical land was eventually established within the region of heavy pack-ice, impenetrable to sailing ships. The reports of the expeditions of Wilkes and D'Urville, conducted in the year 1840 in the region immediately south of Australia, merely served to heighten the interest. Their accounts, convincing as to the severity of the climate even outside the Antarctic circle, were disappointingly vague about the nature of the lands seen, or even the character of the neighbouring ocean floor. Unquestionably land had been seen by both expeditions, but certainly no adequate evidence of the existence of a continent had been secured.

The Australian Expedition of 1911–14 undertook the exploration of the region visited by Wilkes and D'Urville, and both by its land journeys and its hydrographical work it was successful in filling in large gaps in our knowledge of the coast-line in that sector.

The question of continuance by Australia of the exploration of what was considered to constitute the Australasian Antarctic region had for some years after the War been under consideration by a sub-committee of the Australian National Research Council. Eventually the Commonwealth Government decided to provide financial assistance for such operations, and I was invited to take command of the expedition. All arrangements were dealt with by a collaborating committee with a representative of the Federal Government as Chairman. Great assistance was also rendered in London by the inter-departmental Polar Committee. The vessel *Discovery* was made available by the British Government. The Hydrographer and members of the *Discovery* Whaling Investigations Staff gave us every assistance in providing for the conduct of a useful programme of oceanographical investigations. Finally, as we hoped to benefit New Zealand by adding to knowledge concerning her



Coast of Enderby Land

Government of the Union of South Africa cordially welcomed the visit of the *Discovery* and extended to the expedition every help in final arrangements at Cape Town. Captain Davis had the ship ready for sea on the morning of October 19, and the voyage south then began.

A course was set for the Crozet Islands, where a landing was made at American Bay, Possession Island, on November 2. Only two days could be spared for observations ashore, but during that time every moment was occupied to fullest advantage by the scientific staff. A plan of the bay and anchorage was made, magnetic constants were determined, and the naturalists made collections ashore.

Possession Island is volcanic. It ranges from low areas clothed in moorland vegetation growing on peat soils to high snow-clad peaks reaching about 5000 feet above sea-level. Ice-worn valleys deeply dissect the flows of basic lava and beds of tuff which compose the island. The abundant population of sea-elephants and a wide range of species of marine bird life domiciled on the island were of special interest to the biologists. The young of the large albatross were found on their nests in an advanced state of development, almost ready to begin their ocean wanderings.

Kerguelen Island was reached on November 12. Messrs. Irvine and Johnston, a South African whaling company which included Kerguelen waters within its sphere of operations, rendered great assistance to our expedition by transporting coal for our use to a whaling base known as Jeanne d'Arc, situated on an arm of Royal Sound near the south-eastern extremity of the island. There we stayed for some days taking on board every ton of coal that we could find room for on the ship. Scientific observations were prosecuted so far as possible without seriously sacrificing the coaling operations. Contrary to the popular idea regarding Kerguelen, we found the island to be of extraordinary scientific and scenic interest. In the first place it is of very large dimensions, some 90 miles in length and 80 miles in greatest breadth, but it is so greatly indented by arms of the sea that the area cannot be much more than 2000 square miles. From boggy and peaty lowlands the hills rise up tier on tier to majestic highlands, in part ice-capped, and culminate in the glacier-furrowed peak known as Mount Ross, which is an extinct volcano 6120 feet above sea-level. The whole island is at present in process of emergence from a glacial cycle, when almost all the land lay buried beneath a flood of ice which has now so far receded that but a small portion remains ice-capped. However, snow falls frequently, so that most of the land is much encumbered with snow except during the short summer. On the south-west coast several valley glaciers reach the sea, the ice breaking away periodically to form icebergs. Everywhere are deeply eroded valleys, formerly excavated and occupied by glaciers. These old glacial valleys can be traced from the highlands down towards the sea as steep-sided excavations, whose wide bottoms are occupied at intervals by lakes and tarns. As this glacial erosion was effective even far below sea-level, the valley floors can be traced as marked depressions well out under the waters of the sea. Around a large part of the coast these valley grooves are closely spaced, resulting in a deeply indented, fjord type of coast-line. Being constituted of successive flows of lava, often with intervening soft tuffs, the steep ridges separating these glacial trenches usually exhibit a terraced appearance.

At their seaward extremity they appear as long peninsulas passing into a succession of islands until finally submerged beneath the ocean waters.

At least a great part of the rock formations of Kerguelen Island is volcanic and evidently of late Tertiary to Pleistocene age. The volcanic magmas represented are principally basaltic and even ultrabasic, but in one area to the south of Royal Sound there are several soda-rich phonolitic intrusions of very recent age, which are actually post-basaltic. Elsewhere on the island, beneath a great thickness of basic effusions, thick beds of conglomerate composed of water-worn boulders are met with. Often associated with the latter are finer-grained fresh-water sediments, passing into a poor grade of brown coal in which the thick stems of trees are clearly discernible. These plant beds may be of middle Tertiary age. High up in the basaltic series is a bed of marine sediments containing an abundance of molluscan remains which would appear to be of late Tertiary age. The boulders composing the conglomerates already referred to are principally of a basic igneous character, but others are more acid and some are gneissic. It has been rumoured that in the south-western portion of the island there is a limited area of more ancient rocks. We were not able to investigate this report.

At lower levels the land is densely clothed in vegetation, including a variety of grasses, herbaceous plants, and ferns, but there are no trees whatever. For the most part this vegetation is typically that of bogs and moors. The predominating species are those which are more or less widely distributed throughout the Subantarctic islands of the Southern Ocean. It is not low temperature so much as incessant winds which determine the peculiar plant growth of these latitudes. Some of the strongly growing grasses have a tendency to develop into large tussocks, especially in the rich swampy areas near sea-level. But the most universally distributed plant is the wild burnet or *Acaena*. Associated with this are a variety of less obvious forms such as ranunculi, mosses, lichens, fungi, and the like. In the more wind-swept areas extensive cushions of *Azorella selago* are the most obvious elements of the vegetation. The fleshy-leafed plant, known to sailors as the Kerguelen Cabbage (*Pringlea antiscorbutica*), noted for its antiscorbutic properties, is generally distributed throughout the vegetated portions of Kerguelen and the other Subantarctic islands of the Indian Ocean.

Kerguelen and its myriad islets are frequented by immense numbers of sea birds whose presence relieves the desolation and loneliness of the land. For the bird life of millions of square miles of ocean there is in the innumerable islets, the lakes and tarns and the vegetated valleys and hill slopes, a wonderful sanctuary and breeding ground, made ideal by the absence of any preying land animals to harass them. In the breeding season, all day long, birds may be seen hurrying backwards and forwards from the sea to their nesting grounds. At night time other species, too timid to run the gauntlet of the barrage of Sea Hawks (*Skua antarcticus*), which during the daytime lie in wait for the smaller birds, fly ashore in countless numbers, swishing through the darkness with unerring flight direct to their nests. Of land birds there are only two varieties, one being the Paddy (*Chionis alba*), which lives on the eggs of other birds and gleanings along the seashore. This interesting and inquisitive creature is found throughout the Subantarctic islands of the Indian and Atlantic Oceans. The

other land bird is a variety of teal duck, which is very abundant and, being excellent to eat, is much in demand for food.

Insect life is abundant and of peculiar interest, for most of the species are flightless. Being unable to escape by flight, these creatures, for self-protection, usually feign death on the approach of danger. On such occasions, from whatever vegetation or rock they have been clinging, they suddenly become rigid and fall, apparently lifeless, to the ground, where they are often indistinguishable from particles of sand and gravel. Seal life, formerly so abundant on these shores, has now been reduced to very small numbers as a consequence of more than one hundred years of unabated massacre by sealers of various nationalities. Sea-elephants are now rarely met with, except in certain isolated bays, difficult of access to sealing craft. The toll taken of animal life for blubber oils in these seas did not confine itself to the whales and seals, but has also thinned out the ranks of the penguins until but vestiges remain of former immense rookeries. Another unfortunate result of human occupation has been the introduction of rabbits and dogs. These rabbits have increased until they have become a plague which has upset the natural plant balance and ruined the vegetation of the island. Especially have they destroyed the more succulent elements which would, under other circumstances, constitute excellent pasture for sheep, cattle, or reindeer. The dogs appear to be descendants of Arctic sledging dogs, said to have been left on the island by the Gauss Expedition. They have reverted to the wolf state, and are destroying all life which formerly found the island a haven of rest.

This wonderful island was first sighted by a French explorer one hundred and sixty years ago, but until recently the charting and occupation of the land was principally effected by British and American sailors. However in 1893 the vessel *Eure* was dispatched to take possession for France. The French claim has been actively maintained in recent years by the permanent residence of one of their nationals at Gazelle Basin. Apart from this, Kerguelen is visited only during part of the year by whaling and sealing folk.

On the morning of November 24 the ship, laden with coal and stores to the limit of her capacity, sailed for Heard Island. The ice-covered volcanic peak, which constitutes a striking feature of the island, was in sight two days later. Captain Davis anchored the vessel in Corinthian Bay early that morning, and a party of nine of the scientific staff, with camping equipment, went ashore at Atlas Cove. There we found a small hut erected by sealers, and this we occupied for some days. Return to the ship was delayed longer than we anticipated by the advent of a spell of stormy weather, which eventually drove the *Discovery* out to sea.

Heard Island, which is in 53 degrees south latitude, is in one of the stormiest sections of the oceans of the world. It was discovered in the year 1853 by Captain J. J. Heard, of the barque *Oriental*, when on a voyage between Boston and Melbourne. It has long been included with British territories. There is still little detailed information concerning the island, for it has rarely been visited except by sealing vessels, which have kept no records. Such other calls as have been made were landings of but a few hours' duration. Consequently only a rough approximation of the outline of the island yet appears on the charts. During our stay we were able to improve our knowledge of the western end

of the island, but stormy weather prevented our surveying the coast-line elsewhere.

The island is about 25 miles in length, elongated in a west-north-west by east-south-east direction. The high mountainous interior is rarely seen as it is almost perpetually enveloped in clouds. The highest point has been reported to measure approximately 7000 feet. We found glaciers descending from the highlands directly into the sea, presenting high ice-cliffs to the waves. Extensive as these ice formations are now, they were much greater in the past, for almost everywhere the exposed rocks show evidence of former glaciation, and morainic matter is distributed widely over the uncovered lowlands. Here again is an oceanic island constructed fundamentally of basic igneous rocks, associated with masses of limestone, formerly globigerina ooze of the sea-bed, which has been raised above sea-level.

Heard Island is seldom relieved from the torment of constant wind, the effect of which is greatly to reduce the abundance and variety of vegetation as compared with that of Kerguelen Island. Here the most prominent elements of the vegetation are tussock grass in low sheltered localities and a striking development of cushions of *Azorella* in more exposed places. So constant however is the wind that large areas of the exposed ground are without any vegetation whatsoever. In such localities the rock shingle exposed on the surface is eloquent of the prevailing conditions, for each pebble is faceted in the fashion characteristic of wind erosion. The fact that Heard Island is situated in such stormy seas has been beneficial in limiting the massacre of seal and penguin life, so that its shores are still well stocked with penguins and sea-elephants.

With difficulty and at some risk we got away from the island in a gale of wind on the morning of December 4. We departed greatly disappointed, for it had been our intention, weather permitting, to re-chart the whole coast-line of the island. As it was necessary to conserve every ounce of coal for operations along Antarctic shores, we could wait no longer for the weather to improve, so the ship was headed to the south-east with the intention of tracing the Kerguelen–Heard Island ridge in that direction.

The *Challenger* and the *Gauss* had found some evidence, mostly indirect, of the continuance of the Kerguelen–Heard Island bank to the south-south-east of the latter island. It was thought that some moderate rise of the sea floor must exist between the above bank and Antarctica in the vicinity of Gauss Berg. This was indicated by the discovery that the bottom water on the west of that line had been found to be slightly warmer than that of the same depth some distance farther to the east. It was anticipated that the soundings we would make on the way from Heard Island to Antarctica would throw further light upon the matter. The echo-sounding apparatus, which, under the direction of the Admiralty, we had installed in the *Discovery*, was a great success, and we obtained an almost continuous series of soundings at close intervals throughout more than 20,000 miles traversed in the Southern Ocean during our two summer cruises. The information obtained through the medium of our echo-sounder on the journey south from Heard Island exceeded expectations, for in about latitude 58° 50′ S. and longitude 77° 44′ E. the floor of the sea was found to rise to within 350 fathoms of the surface. Soundings were again taken in this area

Hoisting the British Flag on King George V Land, 5 January 1931

Reading the proclamation at Scullin Monolith, 13 February 1931

Icebergs aground in 120 fathoms off Cape Batterbee, Enderby Land

Icebergs aground in 120 fathoms off Cape Batterbee, Enderby Land

on the return voyage the following year, thus further defining this shallow region which we have named the Banzare Rise.

On December 7, in latitude 58° 47′ S. and longitude 77° 43′ E., the *Discovery* entered waters abundantly strewn with icebergs. From thence south, floating ice continued to increase until pack-ice was met on December 8 in latitude 60° 17′ S. Continuing the voyage south, during the next few days we passed a colossal quantity of ice, much of it of an exceptionally heavy type derived from crushed and hummocky floes. After traversing a navigable belt of pack-strewn sea, 300 miles wide from north to south, the vessel was brought to a halt in impenetrable heavy pack in latitude 65° 5′ S., longitude 81° 5′ E. Fifty-eight years previously the *Challenger* had sailed south in that neighbourhood and found open water where now was formidable pack. It was evident that we had come south in what was a bad ice season, at least for that region. Our farthest south in this locality was reached on December 15, in 65° 41′ S. There the pack was everywhere practically impenetrable to the south and the ship was still in deep soundings.

We decided to work towards the west, and there followed many days of slow progress through the ice. A gale of wind, blowing for a few days preceding Christmas, helped greatly to open up the pack, so that on Christmas Day, when the wind abated, a passage to the south-west was found practicable. In that direction the sea-floor shoaled rapidly, and by noon on December 26 we were in 258 fathoms of water in latitude 66° 57′ S., longitude 71° 57′ E. At that point further progress was barred by solid, unbroken, hummocky floe-ice extending as far as the eye could reach to the south-south-west. In the evening hours there came across the ice an outflow of cold continental air, such as on previous expeditions we had found to be a regular diurnal feature along the Antarctic land margin during the evening hours as the sun sank low in the south. From the masthead could be seen for a time what appeared to be the smooth slopes of land ice miraged up on the south-western horizon. The next day, with the warming of the atmosphere, the mirage disappeared and only unbroken floe was to be seen in that direction. The evidence was sufficient to convince me that high land lay to the south-west. Dredgings made with the large Monagasque trawl brought up quantities of rock specimens all of continental type.

We were anxious to make use of the aeroplane, but it was deemed to be too windy for a successful take-off from the sea, and a flight, which would have been invaluable at this time, had to be postponed. Subsequently this small aeroplane proved of great value throughout both cruises. Unfortunately there was no space available on the ship to provide a proper housing for the aeroplane, and it had to be carried on skids of limited dimensions above the upper deck. There it was in great danger of damage during rough weather and also offered so much windage as to increase considerably the difficulty of handling the vessel in bad weather. The large amount of rigging on the vessel, and consequent limited free space when hoisting the aeroplane overboard, always made that operation a troublesome one. The fact that the vessel was never on an even keel, but always rolling more or less, introduced difficulties in the safe handling of the machine on these occasions. When suspended from the derrick, the slightest impact with any of the ship's rigging or structures would result in very

serious damage to the aeroplane. On each occasion that it was used therefore much trouble was entailed and much time consumed in preparations for the flight and in stowage of the machine on return. Also a successful take-off from the water could be effected only when the sea was sufficiently smooth and the water sufficiently free from floating lumps of ice. Collision with even a small piece of ice when speeding up for a take-off would inevitably rip or tear off a float and end in disaster. For these reasons the occasions when we were able to make aerial reconnaissances were much less frequent than we should have liked.

In an attempt to press through the ice and approach nearer to the land, we continued to work a passage still farther to the west. On December 29 the ship was once more against the edge of unbroken, hummocky floe in latitude 66° 10′ S. and longitude 65° 10′ E. The conditions then being favourable for aviation, Campbell and Douglas ascended to an elevation of 5000 feet. They reported a wide sheet of continuous heavy floe-ice extending to the south, then a narrow belt of more open water leading on to undulating ice-covered land. Away to the south-south-west, embedded in the floe and in the neighbourhood of many grounded bergs, some small, black, peaked islets were seen. The distance of this land from the ship was gauged only very roughly, and our operations the following year showed that the distance had been considerably underestimated. That evening we steamed to the west, intending to make a more extended flight from a station in that direction the following day. Unfortunately the weather changed and the ice packed more tightly, so that several days were occupied during bad weather in making a considerable detour to the north.

During all this time a continuous programme of scientific observations was being carried out on board the ship. In addition to the daily routine observations which were executed throughout the course of the voyage by the meteorologists, the hydrologists, and the biologists records of a special nature were obtained at frequent intervals. On these occasions the progress of the ship was halted for many hours at a time for the conduct of "vertical stations." These were occasions when the hydrologist would secure temperatures and samples of the sea-water at intervals from the surface to the floor of the ocean. At the same time, the biologists executed a plankton survey by a series of nettings from the surface to the depth of 1000 metres. From time to time plankton and nekton were taken in a large 2-metre net at still greater depths; also trawlings and dredgings were made on the sea-floor itself. We studied carefully the stones that came up in these dredgings, for as they are erratics carried out to sea from the neighbouring Antarctic land, they supplied valuable indications concerning the nature of the rocks composing the ice-capped and perhaps otherwise inaccessible portions of the Antarctic coast-line. In the meteorological domain much valuable information was regularly acquired by the release of sounding balloons. In this fashion data were obtained concerning the upper air currents to a height of over 50,000 feet.

On January 3 good progress was again made to the south. On the next day, in latitude 66° 35′ S., longitude 61° 17′ E., we were over a rapidly shelving sea-floor, the depth being about 550 fathoms. During the evening hours the slopes of land-ice, with several sharp, peaked, protruding nunataks, were miraged up

along the southern horizon. On January 5 the weather improved, so Campbell and I ascended to a height of 4000 feet and flew some distance east and west and towards the land. To the south at a considerable distance across pack-ice the land-ice slopes could be seen rising rapidly to a high plateau studded with isolated peaks. To the south-east, not far from the coast, several rocky ranges were observed rising from the ice-sheet. Away to the west the land could be seen extending much farther to the north than was the case in the longitude where we had left the ship. Here again we underestimated the distance of the land margin from the ship, a fact which was discovered on revisiting the area the following year. With a view to more carefully mapping the new land, it was intended to make another ascent the following day, but unfortunately the weather broke suddenly that night. A hurricane descended, during the course of which much damage was done to the aeroplane wings, necessitating considerable repairs when the weather was sufficiently abated to effect them.

Bad weather continued until the morning of January 12, when the wind fell and the atmosphere cleared sufficiently to offer a considerable range of view. Our stock of coal was now very greatly depleted and Enderby Land, which was one of our principal objectives, had not yet been reached. Accordingly it was decided that no more time could be devoted during this cruise to the investigation of the extensive new land area already located and which we had named Mac-Robertson Land in honour of the expedition's chief patron. The ship was reluctantly headed to the west to investigate the existence or otherwise of the landfalls reported by Biscoe and Kemp one hundred years ago.

We had with us a copy of a chart housed at the Admiralty, evidently dating from about the period of Biscoe and Kemp's voyages to this region, upon which Kemp's track and landfall is shown. There also appears a special note to the effect that the longitudes recorded are those calculated from one of his two chronometers, but apparently the positions would be moved about $2\frac{1}{2}$ degrees to the west if the second chronometer were adopted as a basis of calculation. Thus Kemp had evidently only two chronometers on board his vessel the *Magnet*. These were doubtless not of the best, and as he was away from port on an extended cruise, he was certainly badly equipped for accurate determinations of longitude. On the other hand he would have little difficulty in determining his latitudes with considerable exactness. We found that in the longitude indicated by his first chronometer and adopted for Kemp's landfall in published charts, the land is actually much farther to the south than indicated by Kemp, but that if the longitude indicated by his second chronometer be accepted, the coast-line thereabouts agreed closely with Kemp's recorded latitude; we therefore concluded that the more westerly location was the correct one. The coast that Kemp actually saw may be about $2\frac{1}{2}$ degrees farther west than is usually indicated on published charts. This coast, which we believe Kemp saw, came into view soon after noon on January 12. At this point the land is encased in ice, but a line of peaks which we have named the Nicholas Range is visible inland. The actual coast-line consists of a line of ice cliffs from 60 to 120 feet in height. A course was set west along this coast. There was at the time an almost continuous belt of pack-ice several miles in width packed tightly and pressed back against the cliffs by the prevailing swell from the north. This ice was also moving slowly westward under the influence

of a pronounced surface drift, which appears to be a permanent feature along this coast.

Early in the morning of January 13 the *Discovery* arrived off what proved to be the most northerly tip of Antarctic land in this region. This we named Cape Batterbee. Nearby, in close proximity to the land, are a large number of small islets and one of large dimensions. The larger island rises to a height of 800 feet and, being entirely composed of dark-coloured rock, it is a striking feature of this portion of the coast. It was decided to erect a cairn on the very summit of this outstanding feature of the Enderby Land coast. At the hour of noon the Union Jack was hoisted thereon and a proclamation was read and subsequently deposited in a casket at the foot of the flagpole. Thus the territories which we had recently discovered, together with the whole of Enderby Land as shown on Biscoe's chart—namely as far west as the 47th degree of east longitude—were claimed for the British Crown. Standing beside the cairn, we could see Biscoe's Mount Codrington rising boldly to a height of 4870 feet from the ice-plateau on Enderby Land to the south-west. The newly discovered land, named Mac-Robertson Land, and the lands seen by Kemp and Enderby were thus found to be all parts of one great salient of Antarctica.

During the few hours ashore we determined the magnetic elements and made geological and biological observations and collections. Rookeries of Adelie penguins occupy the lower slopes of Proclamation Island and other low, rocky islets and rock outcrops on the coast at Cape Batterbee. Antarctic petrels and snow petrels were found nesting at higher levels. A few Weddell seals basked in the sunshine on the ice-foot and in the little coves on the south side of the island. Abundance of marine life was noted in the shallow waters adjacent to the land. The plentiful growth of marine algae is worthy of special mention. The rock formations examined consist uniformly of gneisses and schists with occasional intrusions of crystalline igneous rocks. Geologically therefore this is a very ancient region, almost certainly pre-Cambrian.

As the day wore on the ice began to pack in between the islets and we had to conclude our visit and depart in the motor launch before our retreat should be entirely cut off. As we were commissioned to extend operations as far to the west as the 45th degree of east longitude, the voyage was continued westward along the coast of Enderby Land. Many nunataks came into view, rising from the ice-plateau. From a turn in the coast, which was designated Cape Close, the land turned towards the south. In the early hours of the following morning we left astern a notable mountain of rock which rises from the sea coast to a height of over 1500 feet. By its position this appears to correspond with the Cape Ann of Biscoe's account. Whilst retaining the name Cape Ann for a point on the coast in this locality, we referred henceforth to the rocky peak as Mount Biscoe. Many other mountains were seen rising from the plateau farther inland.

Westward from this neighbourhood a dense belt of pack-ice held us far off the coast. During the afternoon a row of fine high peaks came into view farther to the south. These peaks were named the Tula Range, to commemorate Biscoe's vessel. Still farther to the south, and in the neighbourhood of the 50th degree of east longitude, a long range of rocky mountains, whose tips were seen to disappear over the southern horizon, could be descried. The pack

headed the ship away from these mountains, but enough was seen to prove the existence of a fine range in that direction. This was charted as the Scott Range, in honour of Captain R. F. Scott. The coast-line itself, trending south towards this range of peaks, was gradually lost to sight in the distance across the ever-broadening belt of pack. Later in the day, near the 48th degree of east longitude, ice-covered land was again sighted, rising to a distinct knob, visible to the south over the pack-ice. Only the higher portions of this land were seen as the lower levels were below our horizon. It now appeared that we had passed a large pack-filled recession in the coast-line leading down towards the Scott Mountains. To this we gave the name Amundsen Bay. Continuing west during the afternoon we kept a sharp lookout for some sort of embayment in the pack-ice which would supply water smooth enough for a take-off for the aeroplane. A flight in this locality was most desirable, for it would supply important data concerning the Scott Mountains and portions of the coast-line, now gradually passing out of range from the ship. Unfortunately, no break appeared along the pack edge to afford the desired shelter.

The *Discovery* was then approaching the western limit of the area assigned for investigation. That evening, when proceeding to the west along the pack edge, the officer on the bridge sighted a vessel several miles ahead. This proved to be the Norwegian exploring vessel *Norvegia*. She was coming our way. At about 8 p.m. the two ships were abreast. On deck she carried two large aeroplanes, and was otherwise deeply laden with coal. After the exchange of several short messages, the *Norvegia* lowered a boat and Captain Riiser-Larsen honoured the *Discovery* by coming on board and discussing matters of mutual interest. I outlined our programme as comprising operations in the Antarctic coastal regions from south of Australia as far west as the 45th degree of east longitude which, according to the sketches laid down by Biscoe, could be considered about the westerly limit of Enderby Land. According to plans, the extension of the cruise for a further 5 degrees to the west was to be considered only if all factors should be most propitious. As we were then so near the 45th degree, the return journey to the east would be commenced within a day or two. Captain Riiser-Larsen was very cordial and agreed that it was most desirable for scientific expeditions into these unknown regions not to squander effort by overlapping, but to operate each within selected regions. He stated that, as we were undertaking the more easterly region, he would wireless for instructions with a view to concentrating their resources on the unknown lying farther to the west. We have suggested that the highest point of the Tula range, about 6100 feet, should be named Mount Riiser-Larsen, and that the last indication of land we saw that day, a high ice-covered dome, should be named after Consul Lars Christensen, the promoter of the *Norvegia* expedition.

That evening the course to the west was continued along the pack-ice edge. The next day a farthest west vertical marine station was executed and the ship's head was then turned about. We decided to concentrate the remainder of our effort on an aerial investigation of the Amundsen Bay area and the Scott Mountains. Proceeding eastward in the early morning hours of the 16th, the officer on watch observed the *Norvegia* on the southern horizon, travelling along the pack-ice edge. It appeared therefore that Captain Riiser-Larsen's

representations had resulted in instructions to confine their operations to the west.

On arriving back at the pack edge, within sight of the Scott Mountains, where we hoped to make an ascent in the aeroplane, we experienced difficulty in finding suitable shelter for a take-off. Later, when all was otherwise satisfactory, the night hours had descended, and with the reduced visibility and the suggestion of bad weather ahead, departure was delayed until the next morning. Unfortunately, by that time a strong wind had sprung up, which in time worked up to a gale. For a time Captain Davis managed to hold the ship in the lee of the pack-ice, but as the hours went by, the wind came in more from the east and even from north of east, effectively breaking up the pack-ice and driving the *Discovery* before it at high speed. Thus the ship was carried before the wind for about 150 miles to west-south-west, where she was hove-to in a big sea.

This gale, which continued for some days, had so far cleared on the morning of January 22 as to allow the ship's position to be accurately fixed. Early that morning ice-capped land was sighted across the pack, far to the south. This south-westerly extension of Enderby Land was centred at longitude 46° E. Its latitude however could not be accurately determined, for of course its height was unknown; also there was no fixed, recognizable point upon its surface which could be used in obtaining cross bearings. Once more a return was made to the pack edge north of the Scott Mountains, but the sea surface, which was heaving under the influence of swell from the north-west, proved to be too rough for a take-off for the aeroplane. The bunkers were now so far depleted that but a few tons of coal remained above the quantity which Captain Davis regarded as the lowest limit permissible for the safe return of the vessel to port. We should have liked to have waited for the advent of improved conditions for an aeroplane take-off, but any such delay necessitated the consumption of coal. After due consideration therefore the vessel was headed back to the northern extremity of Enderby Land, where quieter conditions of the sea surface might be expected in the lee of large icebergs which are there in abundance, stranded upon offshore banks.

On January 24 several short flights were made in the neighbourhood of Proclamation Island. Others were made on January 26 at a point farther east. As a result of these aerial observations upwards of two hundred peaks were observed rising from the ice-plateau of these new lands. In the far interior the land ice appeared to reach a height of about 5000 feet, whilst protruding peaks were judged to attain a height of quite 7000 feet. Whilst flying over the land ice a flag was dropped and subsequently was observed lying upon the surface of the ice. On January 25 a second proclamation was read claiming the new lands seen as far west as the 45th degree of east longitude.

On January 26, in the height of the Antarctic season, when the condition of the pack-ice was improving rapidly, we had reluctantly to turn north towards Kerguelen Island, where there were still stocks of coal sufficient to take the vessel back to Australia. We reached Kerguelen Island on February 8. Coaling operations were conducted by the ship's crew whilst the scientific staff prosecuted further investigations in that extremely interesting locality. By means of the aeroplane and otherwise, certain additions and corrections were made

to the existing chart. Coaling was not completed until February 20. Then the weather broke and there followed a succession of gales. It was evident that summer was over and that the best use that could be made of the remaining time would be to run a series of deep-sea stations between Kerguelen Island and the south-west corner of the Australian Continent. This programme came to an end on our arrival off Albany on March 21.

During the winter months of 1930 the *Discovery* was refitted at the Williamstown Dockyards, Melbourne, in preparation for a second Antarctic cruise in the summer of 1930–31. With a vessel like the *Discovery* great use can be made of sail when outside the ice zone, but within the latter the useful work possible is closely related to coal reserves. As a result of the previous season's operations it had been clearly illustrated that, even with the vessel filled to her utmost capacity with coal, she could not carry sufficient to allow of the continuance of operations throughout the entire Antarctic season. To make full use of the latter it was essential that additional coal supplies be available at intervals throughout the cruise. Every effort therefore was made to secure the supply of coal from whaling vessels which would be operating in the waters to be visited. Response to our inquiries was disappointing, though eventually the *Sir James Clark Ross* kindly agreed to transport 100 tons, to be made available in about the longitude of the Balleny Islands. This was a great help, but we had hoped for the provision of 200 to 300 tons when off either Adelie Land or Queen Mary Land.

Captain J. K. Davis was not able to come south on the second cruise, but he had so ably passed on to his officers a knowledge of ice navigation that we had no misgivings when Captain K. N. MacKenzie, the former chief officer, was promoted to captain. A. M. Stanton was appointed to fill the vacancy of chief officer. Colbeck and Child had, on the first cruise, filled their posts so admirably that I was anxious for them to continue with the same duties. The only other changes in the wardroom staff for the second cruise was the inclusion of A. L. Kennedy for special work in connection with physical research and the appointment of Lieut. K. Oom, R.A.N., in place of Commander M. H. Moyes, R.A.N., who was unable to get away for a second year.

Hobart was the final port of departure for the second cruise which commenced on 22 November 1930. As we had to go east at least as far as the Balleny Islands, in order to pick up the coal from the *Sir James Clark Ross*, we decided to call at Macquarie Island *en route* south. Leaving Tasmania behind, we set a course with a view to further delineation by soundings of the limits of the Mill Rise, a remarkable plateau of the ocean floor, located south of Tasmania by sounding operations from the *Aurora*, conducted by Captain J. K. Davis during our 1911–14 expedition. This Mill Rise extends over an area comparable in size with that of Tasmania, where the sea-bottom rises suddenly from oceanic depths to a relatively shallow area of from 600 to 700 fathoms.

For several days before reaching Macquarie Island much fog was encountered, due apparently to the invasion of cold Antarctic surface waters which were found to have approached much closer to Tasmania than is usually the case. This northward thrust from the Antarctic was still more clearly illus-

trated when icebergs came into view a day before reaching Macquarie Island. Also a number of bergs were found to be aground in shoal waters skirting the western side of the Macquaries. As icebergs have rarely been seen from the island, our visit on this occasion evidently coincided with a cold spell. The same fact was further illustrated during this past winter (1931) by a report appearing in the daily Press advising that an iceberg had been sighted at no great distance from Dunedin, New Zealand. Anchor was dropped in Buckle's Bay, Macquarie Island, on the evening of December 31. Here most of the scientific staff spent two days ashore under rather unpleasant weather conditions, for a westerly gale was blowing and fog and misty rain descended over the island. Many valuable observations were made. Notably the field magnetic station of the 1911–14 expedition was reoccupied.

No one has lived on the island for some years past. A sealing licence, formerly issued, was suspended in 1916, it being resolved by the Tasmanian Government, under whose jurisdiction the island falls, to maintain this outpost henceforth as a sanctuary for Subantarctic bird and seal life. The respite from slaughter enjoyed by the animals during the last decade has had a most salutary effect upon their numbers. The roaring of the sea-elephants could be heard on board the ship at the anchorage a full half-mile out to sea; while the raucous babble of penguins echoes along the shores and in many a secluded valley far inland, where the Royal Penguins conduct their nesting operations on a stupendous scale. Our third day in the vicinity of Macquarie Island was spent near the south end, at Lusitania Bay. There we found a definite increase in numbers of the King Penguin rookery, which had formerly been threatened with extinction by the depredations of sealers.

Though the weather was still foggy when we started south from the main island we were yet able to improve the charting of the Bishop and Clerk Rocks. The larger of this outlying group of islets, the Bishop, exceeds 100 feet in height and supports a rookery of penguins. Farther south from Macquarie Island a submarine ridge was traced by soundings for several hundred miles, thus lending support to the possible existence of Emerald Island. In recent times the existence of the latter, which figures on some of the older charts, has become generally discredited owing to the failure of several vessels to locate it in the charted position. The latitude assigned for Emerald Island was reached by us in foggy weather with a gale of wind blowing from the west. This was unfortunate, for a comparatively shallow sounding, only 800 fathoms, was obtained thereabouts, and, given better weather conditions, a search farther to the east would have been made. Delay in proceeding south in the hope of fine weather could not be considered. The shallow area met with south of Macquarie Island in about latitude 57° we have designated the Hjort Rise to commemorate the Norwegian oceanographer.

It was soon discovered by the medium of wireless that, owing to scarcity of whales in the neighbourhood of the Balleny Islands, where we had expected to meet her, the *Sir James Clark Ross* had found it necessary to move east and was located near the 180th meridian. As our operations were planned to the region west of the Balleny Islands, this circumstance ultimately cost us ten days and 60 tons of coal. In compensation, oceanographic operations were carried farther to the east than was originally intended. Farther south ice-

bergs became very numerous in latitude 58°, and loose pack-ice was met in 62° on December 10. In the early morning watch of December 18, the *Sir James Clark Ross* was sighted and we were soon moored alongside taking the coal on board. Captain Nilsen was most helpful, rendering every possible assistance.

The journey west began on December 16 and continued amongst pack-ice without any break of special interest until the 28th, when a point north of Adelie Land was reached. Much to our disappointment the ice conditions in the neighbourhood and west of the Balleny Islands were found to be exceptionally adverse, so that a close approach to the land was impossible. On December 29 another 22,000-ton whaler, the *Kosmos*, was located in our vicinity. Upon visiting the *Kosmos* we were cordially received by Captain Andraesen and by Captain Dingsør, a Norwegian inspector of fisheries, who happened to be on board. We were delighted to be informed by Captain Andraesen that they could spare us about 50 tons of coal. For this we were very grateful. Having taken this coal on board, the *Discovery* then proceeded south through loose pack towards Adelie Land. A south-easterly gale intervened which eventually worked up into a hurricane and continued many days. This caught the *Discovery* in a bad position, for we were on the weather edge of a belt of pack-ice. At times our position was most critical. Only by the excellent handling by Captain MacKenzie and the ship's officers was the vessel safely piloted through her troubles.

Late on January 4, in a gale of wind, after six days thus battling with the elements, anchor was cast off Cape Denison on the coast of King George V Land,* where almost twenty years ago some of us had wintered for two seasons. On the morning of the 5th, the wind having calmed down, a landing was made. Kennedy redetermined the magnetic elements after this long interval of time. His observations show that the south magnetic pole had, in the interval, steadily moved to the north-west and was now probably not more than 250 miles distant from Cape Denison. While other scientific observations were in progress I was greatly interested in examining our old living hut which, it was surprising to find, had withstood twenty years of ceaseless violent wind. For the greater part of the year the structure would, no doubt, be protected by burial beneath packed snow. Only for a short time at midsummer would more than the tip of the roof show above the snow surface. Remarkable effects of snow-blast erosion were everywhere evidenced on the exposed timbers. In many places the planks had thus been reduced in thickness by more than half an inch. Inside the hut, which had been sealed so long, great masses of delicate ice crystals hung in festoons.

At noon on the 5th the flag was hoisted on a rocky point overlooking the bay. In a casket at the foot of the pole a proclamation was deposited, claiming formal possession of King George V Land, defined as that section of the Antarctic coast-line extending between the 142nd and the 160th degree of east longitude.

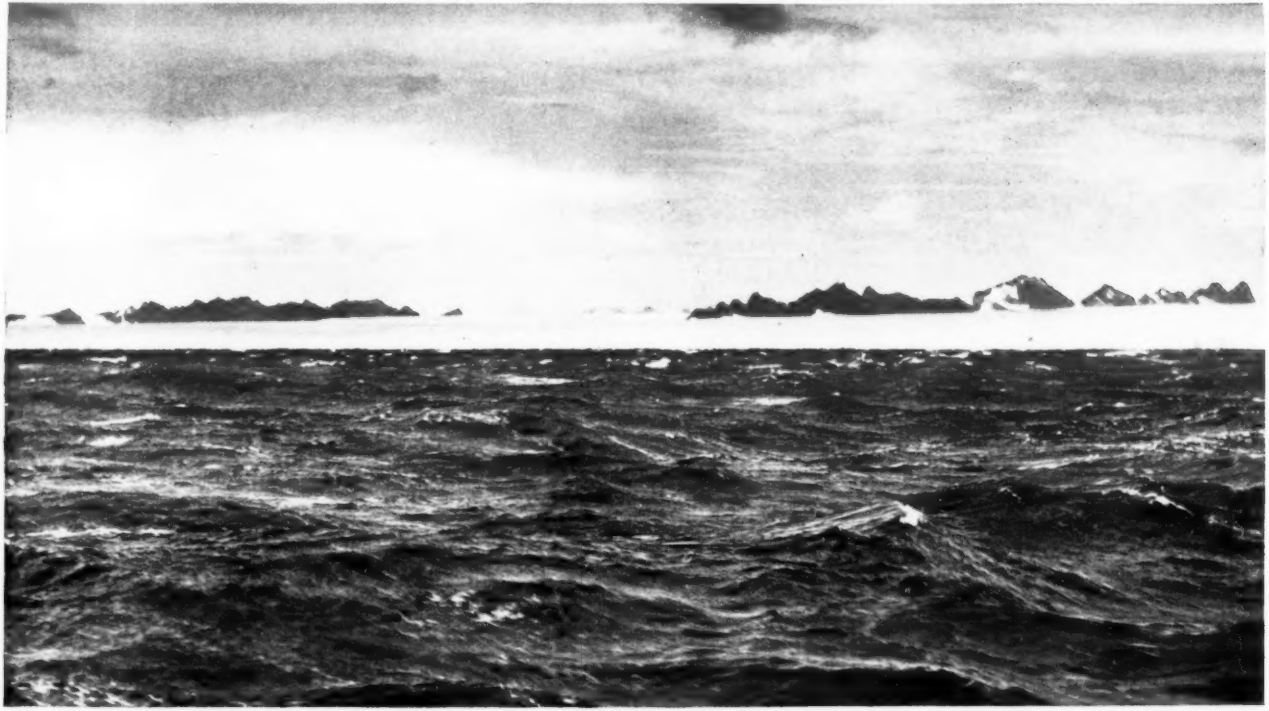
The voyage was resumed westwards on the evening of the 6th. As we

*Under the name Adelie Land this territory was formerly included with that sighted by Admiral Dumont D'Urville in 1840. Now all the new coast-line discovered by our 1911–14 expedition, to the east of D'Urville's Adelie Land, has been charted under the title of King George V Land.

steamed westward along the coast of Adelie Land, some uncharted features were observed and recorded, chief amongst which is a notable nunatak, situated not far above sea-level in longitude 141° 20′ E. This we named the Lacroix Nunatak, after the distinguished French geologist. On January 7, in longitude 138° E., Campbell and Douglas ascended in the aeroplane to give it a trial and to examine the ice-jam which at this point obstructs further progress to the west. The coast-line was found to extend somewhat north of west as far as the eye could reach, and is in fact the coast-line seen from the *Aurora* in 1912, when it was charted as Wilkes's Land. Nothing more notable was observed off the coast in this locality than an extensive sheet of consolidated pack-ice held together by many grounded bergs. It now appears certain that the high ice-cliff coast sighted north of this locality by Wilkes and D'Urville some ninety years ago was of the nature of an immense flat-topped ice formation, possibly a berg, grounded on shoal waters which certainly extend considerably to the north of the mainland in about longitude 136° E. The pack belt north of Adelie Land, separating the coastal waters, which we long ago named the D'Urville Sea, from the Southern Ocean, was more extensive in the summer of 1930–31 than has ever previously been recorded. In order to get to the west of the ice-jam north of Cape Bickerton, the *Discovery* had to push her way through to the north of this pack belt, an operation which occupied the whole of January 8. Once more on the northern edge of the pack, further progress was made to the west. Some days were spent weathering out a gale which did not abate until January 14.

On the morning of January 15, when the ship was in latitude 64° 49′ S. and longitude 124° 58′ E., the sea was sufficiently smooth for the aeroplane to take off. Campbell and Oom ascended to 8000 feet to ascertain whether there was any passage to the south through the pack-ice; also whether any land was within sight. Land was seen bearing south-east, at a distance estimated at not less than 95 miles. From that point the coast appeared to run east on the one side and south-west on the other. This angle of the coast has been designated Cape Goodenough, in recognition of the cordial assistance rendered by the President of this Society. Practically the whole of the region from the ship to the land was choked with massed pack-ice. There were only three areas of comparatively open water though thickly studded with bergs. These areas were in the east-south-east and south. A faint water-sky was observed between south-south-west and south-west, evidently at a great distance.

The ship continued west along the pack margin. The following day being again fine weather, another aerial reconnaissance was conducted. The ship was in latitude 65° 5′ S., longitude 120° 36′ E. On this occasion Douglas and Oom again ascended to a height of 8000 feet, where a continuation of the land seen the previous day was observed bearing south by east at a great distance from the ship, estimated to be 110 miles. The coast was still trending to the south of west. A considerable area of open water in the lee of numerous closely packed bergs was observed far over the pack to the south-west. This was evidently a belt of land-water kept free by the south-easterly wind off the land; also by a barrier of grounded bergs on the east which diverts towards the north the pack drifting to the west. To take the ship through this 60 or 70 miles or more of dense pack to the slack water was out of the question, for



Mac-Robertson Land

Murray Monolith, Mac-Robertson Land

Murray Monolith, Mac-Robertson Land

progress could be made only at an extraordinarily slow rate and at the expenditure of so much coal that all work farther to the west would have been jeopardized if not entirely prevented. This land, seen on January 15 and 16, which evidently joins our Wilkes's Land on the east, has been charted as Banzare Land. As it extends towards the west, Banzare Land recedes to a higher latitude.

The cruise was continued to the west along the unbroken margin of dense pack-ice. Unfortunately the weather became overcast. We were then in the vicinity of Balleny's supposed landfall recorded in the year 1839. We proved quite conclusively that land does not exist in that neighbourhood. The following day, in the vicinity of latitude 64° 21′ S. and longitude 117° E., I ascended in the aeroplane with Campbell to a height of about 3000 feet, above which level dense clouds obscured the view. We were thus unable to observe any great distance. At that height the pack extended to the horizon on the south. In the south-south-west however, near the limit of vision, was a definite change in the view, and there is there either a great jam of icebergs or what appears to be ice-covered low land. Should the latter prove to be the case on further investigation, we propose that the term Sabrina Land be applied to it to commemorate Balleny's effort.

There then followed a number of days during which the conditions were unsuitable for flight. Overcast and foggy weather was succeeded by gales of wind. During this time the advent of better conditions for extending aerial observations was anxiously awaited. The ship drifted steadily to the west. On January 24 the ship was close to the charted position of Budd's Land. Observations showed that land does not exist in the position indicated on Wilkes's chart. On the morning of the 25th however, in latitude 64° 55′ S. and longitude 112° E., a change appeared in the sky conditions in the south and south-east, strongly suggestive of the proximity of land. Such land would however be situated at a great distance from the ship.

We were most anxious to make further flights before passing the charted position of Knox Land, and with this in view spent much time in bad weather keeping the ship up to the east. Both wind and current were all the time carrying her away to the west. So much coal was already expended in holding on for the advent of better weather conditions that it was now felt that we had come to the end of our resources so far as this section of the coast was concerned. On January 27, instead of improving, the weather appeared likely to take a turn for the worse, for the barometer was falling. Here therefore was our last chance for observation in the Knox Land vicinity. I decided to make the most of the opportunity, but in so doing, on account of the roughness of the sea, we seriously damaged the aeroplane, though Douglas and myself escaped without serious injury. The position of the ship when we took off was about latitude 65° 7′ S., longitude 107° 22′ E. We ascended through several banks of clouds, finally reaching an elevation of close on 6000 feet. All view below was then obstructed by clouds, except on the far southern horizon, in the direction of Wilkes's Knox Land. There the cloud canopy was absent and the sun was shining brightly on what appeared to be undulating land-ice. What we observed was certainly a great distance to the south. The clouds obscured the southern limit of the pack-ice, and such coast-line as may be there was hidden by the pall

of cloud. At lower elevations, before entering the cloud zone, we had a very extended and but little impeded view across the pack. At 15 or 20 miles to the south-east was a very solid bank of apparently unbroken consolidated pack. At these lower altitudes the pack was observed extending to our southern horizon. To the west the pack edge trended somewhat to the north, and there were embedded in it, evidently aground, numbers of very large bergs, some of them in the far distance resembling low ice-capped islands. That evening, after hoisting on board the partially wrecked aeroplane, the voyage west was continued in rapidly freshening east-south-east weather.

The ship was then in waters of 300 fathoms and less. On the morning of January 28, as we proceeded through scattered pack and bergs along the margin of the heavy ice which lay on our port beam, a long, low, ice-capped island was seen amongst the pack-ice at a distance of about 20 miles to the west of the vessel. This island we named Bowman Island in recognition of the assistance rendered to our expedition by Dr. Isaiah Bowman, of the American Geographical Society. It is of an evenly domed shape and rises to a height calculated to be somewhat over 1000 feet. Many large bergs were observed to be aground in the shoal waters surrounding the island. In this region a large area occupied by pack-ice during the period of the 1911–14 expedition was now found to be free, and there was consequently every hope of our making further interesting discoveries in the neighbourhood. Up to that time the ice conditions met with during the cruise were much worse than anything recorded at the time of Wilkes's visit or during the period of our 1911–14 expedition. Unfortunately, a fierce gale now intervened and drove the vessel away before it from the interesting area just located. January 29, and more especially the evening hours, was a period of great anxiety, for with very limited range of vision the ship was flying before the wind through waters plentifully infested with bergs. Captain MacKenzie stood the ship out to the east as far as possible in an effort to escape being driven on to Termination Ice Tongue as charted by the 1911–14 expedition. On January 30, as the day progressed, the weather improved, and the ship was steamed back to the south-east with a view to reaching the shelter of Termination Ice Tongue. Great was our surprise however when it was found that no such tongue now existed. In its place there remained only a number of grounded bergs. In the absence of this tongue of ice which had formerly held back the westward-drifting pack-ice, the latter had now surged round the end of the Shackleton Shelf with the result that the Davis Sea was certainly much more restricted than formerly. Also a passage through to that region of free coastal water was rendered much more difficult than was formerly the case.

As we had planned to visit the Emperor penguin rookery at Haswell Island, off the coast of Queen Mary Land, an effort was made to push through the intervening pack. This however was soon abandoned, for the rate of progress in proportion to coal consumption was most discouraging. Easier access to the south was expected on the 90th meridian, but there again the weather was adverse. Though the ice was comparatively slack, continual south-easterly weather, with fog and snow, so limited vision that satisfactory progress against the drifting ice could not be made. Valuable time and still more valuable coal were being used up. Consequently, as the Queen Mary Land coast had already

been well mapped by the Australasian Expedition of 1911–14, it was decided to reserve our resources for the investigation of the yet unknown areas farther west.

West of the 90th meridian the pack-ice was found to be composed of very heavy floes, but there were many deep indentations on its northern margin. On February 6, when in the neighbourhood of the 84th degree of east longitude, Campbell and Douglas made a short flight with a view partly to testing the air-worthiness of the now repaired aeroplane. For many days Campbell and Douglas, with the assistance of others, had worked upon it, repairing the damage so far as possible. It now flew with a distinct droop to the right side, but was considered by the aviators to be again in a useful condition. On the occasion of this flight visibility was limited, but their observations demonstrated that there was nothing but a region of heavy pack for at least 40 miles to the south of the ship's position. That day we fell in with the whaling vessel *Falk*. Captain Lars Andersen, the manager of this whaling venture, cordially offered to spare us 20 tons of coal. This we soon had on board, the Norwegians rendering every assistance.

On the morning of February 8, in the vicinity of the 79th degree of east longitude, still working to the west, the *Discovery* emerged from a belt of pack-ice into open sea. The previous season, coming south from Heard Island, we had arrived in the same locality, which was then the centre of a vast region of pack-ice. There was general elation amongst the ship's company to find the ice conditions so favourable this season. As the pack receded rapidly to the south, we followed it in that direction. In these open waters several large British and Norwegian whaling vessels were passed. The open water was found to extend almost to the *Challenger's* farthest south point.

On February 9, though the swell in the open sea was too great for the aeroplane to attempt to take off, Campbell succeeded later in the day in getting it up from a pool of water in the lee of a large berg amongst the pack-ice. This was in latitude 66½° S., longitude 76° E. At 5200 feet I had a fine view over the pack-ice to the south. Away to the east-south-east was a jumble of large bergs aground. This shoal is close to and a little to the south of the farthest south point reached by the *Challenger* in the year 1874. The belt of bergs was seen to stretch south to what appeared to be ice-covered land seen merely as a faint line around the southern horizon extending from south-east to south-west. A few days later we had confirmation of this landfall, and it gave us great pleasure to name this new discovery Princess Elizabeth Land. South of our position the tight pack was seen to extend almost to the horizon where there was some slackness indicated extending into open water patches in the south-south-west and south-west.

It was decided to continue south-west towards the region where slacker pack was observed. Some 50 miles farther on in that direction the ice was found to be fairly loose, with occasional irregular lanes distributed sporadically through it. Very little life had been seen on the heavy pack-ice passed during the previous three days, but here great numbers of sea-leopards were met, basking on the rafts of ice. This was certainly an indication of more open water to the south. A short flight was made at a low altitude, but as visibility was bad, nothing was observed beyond the pack-ice to the south. There was

however an indication that the ice conditions were improving still farther to the west. A course was continued in that direction. Next morning ice-covered land came into view from the ship's deck. At this point it is completely ice covered, rising inland to an undulating plateau. The ship approached the land where there was a prominent angle in the coast, which we have named Cape Darnley, after the Chairman of the "*Discovery* Investigations" Committee, who had been so helpful in the initial stages of the expedition. At that point a south-to-north trending coast turned sharply to the west. From the mast-head the south-running coast was observed to be fringed with much open water, to reach which Captain MacKenzie pushed the vessel through the intervening pack. On arriving at the south side of this bar of pack, there was so much sea running under the influence of a southerly wind that it was at once apparent that a large sheet of open water lay to the south. Into this we steamed, full speed, until later in the afternoon, when the lee of a gigantic grounded berg was reached. Here the water was sufficiently smooth for the aeroplane to take off.

Campbell and Oom got into the air after narrowly averting a serious collision with a floating mass of transparent ice. Some damage was done to the under-carriage, but did not prevent them taking off. They followed the coast along for some distance, and, before descending, Oom made a sketch-map of a great extent of coast, tracing it south in a wide embayment to beyond the 69th degree of latitude. It was then seen to turn sharply to the north, and, finally, again sharply to the east at a point which we named Cape Amery. Farther to the east is the land which we had dimly seen from the aeroplane on the 9th and named Princess Elizabeth Land. The sea of open water in which the ship lay is land-locked on the south and west and limited by pack on the north and east. I decided to name this sheet of water, which is probably an annually recurring feature during the summer months, the MacKenzie Sea.

The season was by this time far advanced and coal stocks so low that more time could not be allocated for the further investigation of this belt of open water within the pack-ice. So the ship was headed north and west, following the coast. This was Mac-Robertson Land, observed dimly at a great distance the previous year. There was indeed a great difference in the ice conditions of the two seasons. When, in the previous summer, we traversed this region, the sea was quite unnavigable. This season, to the west of the 70th meridian, there was practically no pack-ice north of latitude 67½° S. Now, steaming close along the coast, we were able to chart the features accurately. Up to this time the Mac-Robertson Land coast had been seen only at a distance and was but approximately located. The clarity of the Antarctic atmosphere during fine weather results in a wonderful degree of visibility, easily misleading in regard to distance.

The voyage west along the Mac-Robertson Land coast proved of great interest. Bold rock headlands and striking ranges of rocky mountains were observed to protrude at intervals from the continental ice-cap. Inland the ice plateau itself was observed to rise to elevations of at least 4000 feet and certain rocky peaks were estimated to reach to at least 6500 feet above sea-level. On February 13 two rocky ranges which reached the coast in the vicinity of the 67th degree of east longitude were investigated. Collections of bird life

and rock specimens were obtained from the seashore. On one of these, the Scullin Monolith, the flag was raised and a casket deposited. From this point to the west numbers of islets rise from the sea for some miles offshore. The presence of these, together with submerged reefs, calls for careful navigation. So far as time would allow, the topographical detail of this region was charted. All went well until the afternoon of February 14, when an easterly gale with driving snow obscured the view. The *Discovery* was now in a very dangerous position, for islets and grounded bergs studded the surrounding sea. Several anxious days and still more anxious nights followed, dodging bergs in thick weather and a high sea. Fortunately, in groping forward, a line of grounded bergs was located. This broke the sea and offered some shelter in its lee. These bergs were aground in something over 100 fathoms of water at a distance of 40 miles from the land.

When the weather improved the ship was again steamed in towards the land in the neighbourhood of the 61st degree of east longitude. There fine rocky exposures are met with along the coast and are seen to outcrop at intervals far inland. At this stage the charting of the very numerous land features that appeared within range, islands, headlands, mountains, and the like, kept Lieutenant Oom extraordinarily busy. Our maps began to bristle with the names of many of those connected directly or indirectly with the expedition, who were thus commemorated. The Masson, David, Casey, and Henderson Ranges, which record some of the members of the Expedition Committee, are striking features. So also is a peak which shows up far inland over the plateau and reaches a height of 6500 feet. This latter has been named after Hugh Robert Mill, who has been so long associated with Antarctic exploration. On the afternoon of February 18 the ship entered an attractive bay and a large party went ashore in the motor launch, landing upon a rocky point to be henceforth known as Cape Bruce. There the flag was raised and cheers given for H.M. the King.

The rocks proved of great interest, representing a wonderful variety of crystalline schists and gneisses, chiefly of deep-seated origin. Cordierite, sillimanite, and garnet, as well as quartz, felspar, and mica, were the most obvious or abundant constituent minerals. Irregular pyritic bands crossing the rock formations were a feature which augured well for mineral possibilities of an economic character. So far as could be ascertained, the whole of the rocks of Mac-Robertson and Princess Elizabeth Lands are of this character. The most outstanding feature is the abundance of garnet distributed throughout the formations. To such an extent is this the case that even the dredged sands of submerged banks far out to sea were noted to exhibit a pink tinge of colour, due to a notable content of pulverized garnet, derived in common with the rest of the sample from the comminution by glacial erosion of the rocks of the adjacent land. As is the case in other portions of Antarctica, the existing plant and animal life on the land, apart from abundance of marine birds and seals which visit the shores, is limited and elementary in form; in fact restricted to mosses and lichens growing on the bare rocks and algae in fresh-water pools, together with microscopic animal life living upon and associated with this lowly organized vegetation.

We should have liked nothing better than to have extended for another

fortnight investigations on this coast, but for some days past Captain MacKenzie had become increasingly anxious on the score of our dwindling store of coal. On the 18th he reported that we had little more than 100 tons left. In view of this position I fully agreed with him that the voyage had been prolonged to the limit of reasonable safety, for before reaching a port where the bunkers could be replenished there was yet to be negotiated a return journey of some thousands of miles. The first part of this course was to be against head winds in iceberg-laden seas, and the remainder through seas notorious for constant gales. Therefore though good use was expected to be made of sails, yet for part of the time at least the engines would be required to stand by in case of emergency. So on February 19 preparations was made for return, two reserve top-gallant yards being run up on the foremast. At the same time efforts were made through the medium of wireless to secure further coal supplies from whalers within reasonable radius. However this inquiry was without success, and nothing remained but to return forthwith. A course was set to pass over the Banzare Rise located during the first cruise. Additional soundings were thus obtained, more clearly defining this shallow area. Some very violent weather was experienced on the return journey, but as the gales were always from astern, they served to hasten our passage. The second Antarctic cruise was completed on our arrival in Hobart on March 19.

APPENDIX I.—SCIENTIFIC RESULTS

Reports dealing with the scientific results of the expedition are in preparation and arrangements are being made for publication. The data obtained are voluminous. The purely geographical observations, brief reference to which has formed the main text of this article, greatly extend knowledge of the Antarctic regions throughout the long arc between Adelie Land and Enderby Land. Some hundreds of miles of new coast-line have been added to the map. Further, the approximate location of so much of the remainder of the margin of the land throughout this arc has been indicated that the existence of an Antarctic land mass of continental proportions is now very much more definite than formerly. In the actual plotting of these geographical discoveries, Colbeck, Oom, and Moyes were principally concerned. To these officers a full measure of credit is due, for at times this work was conducted under difficult conditions.

Once again operating throughout the sphere of Wilkes's voyage executed ninety years previously, I was again struck with the merit of his excellent performance conducted with ships provided only with sail, and but poorly constituted and equipped for operations in the Polar regions. The Wilkes Expedition certainly deserves more credit than has usually been accorded to that superhuman effort. Not only did they independently discover D'Urville's Adelie Land, but they also sighted new land elsewhere within that region then entirely unknown. Information supplied by that expedition regarding the weather and the pack-ice conditions prevailing throughout the whole summer season is of permanent value and in itself a meritorious achievement.

During the progress of both cruises of the B.A.N.Z.A.R.E. extensive oceanographical investigations were made. Thus forty stations were occupied for hydrological observations in vertical series from the surface to the floor of the sea. These were principally in deep water off the continental shelf. The water samples thus obtained were all thoroughly investigated by Howard as regards

their important chemical characteristics. The examination of the surface waters at four-hourly intervals was a routine matter. Soundings were made at regular intervals, with a result that a total of about 1800 records has been obtained within the area of the Southern Ocean. The officers chiefly responsible for soundings were Campbell, Moyes, and Oom. So closely spaced are these soundings in Antarctic waters that, taken in conjunction with those obtained on the 1911–14 Expedition, there are now sufficient data to allow of the plotting in approximate position of the 1000-metre depth-line around the whole arc investigated. Even the 500-metre ocean-floor contour can be indicated over a great part of this length.

Biological observations were given a very prominent place in the expedition programme, with Professor T. Harvey Johnston as chief officer for this department. In addition to marine investigations which constituted the main object of their inquiries, collections were made on the Antarctic mainland and on the various Subantarctic islands visited. Thanks to the assistance of Marr, lent by the *Discovery* Investigations Committee, special attention was given to the study of plankton, both in its horizontal and vertical distribution. Fletcher assisted with this biological programme, as also did Dr. Ingram, who also conducted some bacteriological investigations. The region that came within our survey is a most interesting province of oceanic bird life. From this standpoint it has been exhaustively studied by Falla, whose observations will make a valuable contribution to the subject of ornithology.

Dredgings in shallow and in deep waters were effected, both for the study of the life of the sea-floor and with the object of securing at intervals samples of the rocks constituting the adjacent ice-blockaded lands; for ice-transported fragments of the latter are everywhere distributed on the sea-floor in Antarctic waters. Rocks thus recovered at frequent stations around the whole Antarctic segment investigated were found to be without exception of a strictly continental character. Interesting rock collections have also been made from outcrops exposed on the newly discovered lands themselves.

Simmers was indefatigable throughout in his meteorological work and has undoubtedly secured data, especially in the matter of upper-air observations, which will considerably assist in the elucidation of Antarctic weather problems. Within the ambit of his inquiries also came measurements of the rate of atmospheric radiation and of the transparency of the atmosphere. Kennedy was principally concerned with magnetic observations and with observations on cosmic penetrating radiation. Picture records illustrating these various activities and portraying features of the new lands discovered have been secured by Hurley, whose technical skill and long experience in Antarctic photography have again been most effective.

The aeroplane proved a most important factor in the prosecution of the geographical programme. Its successful operation, at times under most difficult conditions, owes everything to the determination and skill of Campbell and Douglas.

In the realization of the above programme every member of the personnel joined enthusiastically and whole-heartedly. The fine work of Captain Davis, Captain MacKenzie, and all the ship's officers and crew is evidenced in their successful handling of the vessel under difficult and hazardous circumstances. My thanks are tendered to each and all for their unstinted co-operation in this mutual endeavour.

APPENDIX II.—NOTES ON THE SIGHTING OF LAND IN ANTARCTICA

26 December 1930

The *Discovery's* further passage to the south-west was stopped on the edge of fast floe-ice at 2.10 a.m. The floe extended to the west and south as far as the eye could reach and had the appearance of being fixed in position and therefore attached to land somewhere to the west or south. The *Discovery* continued all day steaming up and down along the edge of the fast floe awaiting an improvement in the weather. Frequent soundings were taken. The noon position (December 26) is given in the log as lat. 66° 57′ S. and long. 71° 57′ E. At 6 p.m. sounding gave a depth of 264 fathoms. The wind died down considerably in the early evening hours, and mirage brought above the south-western horizon what appeared to be the undulating surface of snow-covered land. This was first noted about 7.20 p.m. and continued in sight for some hours. Our considered opinion at the time was that we had seen land very far distant, evidently below the horizon from the masthead during the warmer hours of the day, but brought into view as the sun descended low into the horizon and a cool flow of air from the highland spread over the sea-ice.

Next morning (December 27) no miraged view of the land was visible to the south-west. The atmospheric conditions in that direction however were still such as occur over ice-covered Antarctic land as distinct from that which is characteristic of pack areas. The continental type of clouds characteristic of Adelie Land was here observed constantly to the south-west of the ship's position. Throughout the morning of the 27th the *Discovery* steamed up and down along the pack edge in the hope that the wind would take off and allow the launching of the aeroplane, which at this date was fully assembled and ready for aerial reconnaissances. By noon there appeared to be no indication of any further improvement in the weather, and in view of the fact that our first duty on this cruise was to investigate the coast of Enderby Land as seen by Biscoe and to take possession of it, we had to turn north reluctantly, since our coal supplies were rapidly diminishing.

31 December 1930

During the forenoon of December 31 a southerly course through the pack was found possible, but by 10 a.m. the vessel had reached compact, heavy floe-ice extending from ENE. to W. by N. This prohibited further approach to the south. The position of the ship at this time was lat. 66° 10′ S., long. 65° 10′ E. The weather improved and the aeroplane was hoisted overboard at 1.10 p.m. After some trial flights the aviators, Campbell and Douglas, ascended to a height of 5000 feet and searched for signs of land. They descended to the water again at 4.40 p.m. They reported that a very wide belt of solid floe containing occasional icebergs extended far to the south, but that it then gave way to a belt of open water a few miles in width, beyond which to the south were undulating rising ice-slopes which appeared to be ice-covered land. To the south-west in the far distance they observed some black objects in the midst of belts of grounded bergs. These were believed to be rocky islets surrounded by bergs aground. Further investigation of this area was prevented by the advent of a gale of wind.

Sighting of the Masson Range, Cape Bruce, etc.: 5 January 1931

On January 5, when the ship was approximately in lat. 66° 30′ S., long. 61° 8′ E., the weather was again favourable for an ascent in the aeroplane. The plane was lowered overboard at 2.40 p.m. and Flight-Lieutenant Campbell and myself ascended several thousand feet to investigate land which was first sighted from

the masthead on the forenoon of January 4. We flew about 30 miles from the ship and obtained a fine view of a great extent of the coast-line of high land extending approximately east and west some miles south of the ship's position. Far to the west the coast could be seen trending to the north and black rocky peaks could be seen 80 or 90 miles away in that direction. Many rocky peaks and ranges were clearly observed and roughly located from the aeroplane that day. The plane was hoisted on board at 4.20 p.m. and a passage to the south-west through loose pack begun. A hurricane now intervened, and it was not until January 12 that we were again able to get in touch with the land.

Sighting of Kemp Land: January 12

On January 12 the weather cleared up by noon, and at 1 p.m. land was sighted to the south, extending between S. 23° E. and N. 84° W. At this spot, rising out of the ice-cap, a line of rocky peaks was observed which has been named the Nicholas Range. The ship was then headed to the west, following within a few miles of the coast-line which was all the time clearly visible from the ship's deck. At times the *Discovery* came within a couple of miles of the ice-cliff, which terminated the land ice-slopes. At 10 p.m. a rocky islet (afterwards designated Proclamation Island) was observed ahead rising boldly from the pack-ice adjacent to the land ice-slopes.

Landing on Proclamation Island: 13 January 1931

On January 13 the motor launch was lowered at 10 a.m. and a landing made at Proclamation Island. The proclamation ceremony was performed exactly at noon on the summit 800 feet above the sea. From this point a fine view of the Enderby Land coast was obtained. Mount Codrington, sighted by Biscoe, was clearly in view. The party returned to the *Discovery* at 3 p.m. The ship then steamed west, keeping the coast in view all the time. The proclamation read at noon that day, a copy of which was deposited in a casket at the base of the flagstaff, claimed for Britain the Antarctic land extending between long. 73° E. and long. 47° E. and south of lat. 65° S. This area was intended to include the land which we had located during the previous several weeks and land farther to the west of Proclamation Island, part of which we could see at the time and the whole of which was roughly indicated as existing in the chart prepared by the British sealer, *Biscoe*.

The observed coast of Enderby Land

After leaving Proclamation Island we remained in sight of the Enderby Land coast throughout the night and the following day until about 8 p.m., when we were so far edged away from it by a widening belt of pack-ice that it dipped below the southern horizon. Shortly afterwards we met the Norwegian ship *Norvegia*, which was steaming along the pack edge from west to east.

During the late afternoon of January 14 we obtained a splendid view of a fine range of rocky peaks which dipped beneath the southern horizon in the neighbourhood of long. 49° and 50° E. of Greenwich. Those peaks we named the Scott Range. They were far distant from the ship and we were not able to fix their position on the chart with any degree of accuracy. It was intended to investigate this area completely with the assistance of the aeroplane, but on account of continuous bad weather subsequently, our intentions in this direction were never carried out.

After a gale lasting many days, the conditions improved steadily on January 22. At 7 a.m. land was seen to the south. By 9 a.m. the new land seen to the south extended between S. 45° E. and SSW. true, as seen from the vessel. The ship's

position at that time was approximately lat. 66° 43′ S., long. 46° E. This land was far distant across the pack-ice, and all we saw was ice-covered highlands. No rocky peaks were visible.

Sighting of Princess Elizabeth Land: 9 February 1931

On 9 February 1931, when in the neighbourhood of lat. 66° 29′ S. and long. 76° 15′ E., the weather was favourable for an aerial reconnaissance. Advantage was taken of a large pool of water in the lee of an extensive tabular berg. Flight-Lieutenant Campbell and myself were lowered overboard in the aeroplane at 1.30 p.m. and took off immediately afterwards.

At a height of 5700 feet we clearly observed a great jumble of icebergs just southward of the point reached by the *Challenger* many years ago. This jumble of bergs developed in a south and south-easterly direction, where at a great distance from us there was a definite appearance of elevated ice-covered land. To the south-west in the dim distance there was slack pack and some open water leading up to a line of ice-coast. A section of this coast (in the location where we subsequently observed two snow-capped mountains named by us the Monro Kerr Mountains) was very hazy as if enveloped in mist. Southward from the aeroplane at this time was a great expanse of dense close pack-ice, but on the southern horizon there appeared to be a narrow belt of water and a low line of ice-coast beyond it. This appearance of a low line of ice-coast extended from the south-west (Monro Kerr Mountains) to the higher land in the south-east beyond the jumble of bergs south of the *Challenger* locality. This land, which we referred to subsequently as Princess Elizabeth Land, was very far distant to the south, and there was at the time considerable doubt as to how much of this was land and how much shelf-ice, perhaps miraged up to appear of greater height. Our doubts were satisfied on February 8, when we were able to trace the Mac-Robertson Land coast around from the west to join in the east with the doubtful land which we had seen from the aeroplane on the 9th.

The charting of the eastern extremity of Mac-Robertson Land

On February 11, whilst continuing a course to the south and west amongst loose ice, we sighted ice-covered land at 9.5 a.m. This was in the vicinity of Cape Darnley. During the next few hours we pushed south through a belt of heavy pack and eventually reached open water at 3 p.m. As there was a moderate sea running in this sheet of open water, we steamed south until arriving in the lee of a large grounded berg, which gave the necessary conditions for an ascent of the seaplane. During the morning and afternoon we had steamed south parallel with the coast of Mac-Robertson Land in full view. About 6 p.m. Campbell and Oom ascended in the aeroplane and they flew about 100 miles, first directing their course to the north-west and afterwards following the coast south for a considerable distance. During this time Oom took observations from the plane sufficient to allow him to chart approximately the coast-line of Mac-Robertson Land as figured in our charts between Cape Darnley and the Monro Kerr Mountains.

As coal was now extremely short and there was no good outcrop on this part of the coast upon which to effect a landing in order to take possession of the land, we steamed to the north and then round to the west, following the coast-line. The coast was kept within sight from this time on until the morning of February 19, when we finally departed for Australia. The times of our several landings from the coast of Mac-Robertson Land subsequent to February 11 are detailed in my paper.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH) said: Interest in the solution of the problems presented to us in the Antarctic is unabated. During the last two years or so there have been no less than three quite first-class expeditions in those regions: that of Dr. Stanley Kemp in the *Discovery II*, an account of whose expedition we heard in December last; that of the *Norvegia* with Captains Riiser-Larsen and Isachsen—and in that connection I would say that we give a most cordial welcome to the Norwegian Minister here this evening and express to him our sympathy in the death of M. Kolstad, the Prime Minister; and thirdly, the expedition of Sir Douglas Mawson in the old *Discovery*, if indeed such a magnificent ship can ever be called old. Sir Douglas Mawson is still in Australia, and the account we shall hear to-night of that expedition will be read by Professor Debenham, himself well known as a traveller and explorer and scientist in the Antarctic. Sir Douglas Mawson is well known in the Society both in name and in person. He was a member of the Shackleton Expedition of 1907; he led the British–Australasian Antarctic Expedition in 1911–1914; and he was the leader of the expedition of which we shall hear to-night. You all know of his marvellous determination and pertinacity combined with a great reputation as a scientist, especially as a geologist. We have in the museum of our Society the sledge on which he made that very remarkable journey when, after he had lost his two companions, he came back 300 miles alone. To-night, as I have said, Professor Debenham will read Sir Douglas Mawson's paper, which I now ask him to commence.

Professor Debenham then read the paper printed above, and a discussion followed.

The PRESIDENT: From his vast storehouse of knowledge I invite Dr. Robert Mill to address us.

Dr. H. R. MILL: I had prepared an opening for these remarks to the effect that we are all profoundly sorry that Sir Douglas Mawson has not been able to be present to read the paper and to thrill us with the description of the new lands as they appeared to the discoverer himself; but Professor Debenham has done his part so very well that while still regretting the absence of Sir Douglas we must thank him sincerely for securing the services of so gifted a substitute. Still, there are several questions one would like to put to the leader of the expedition, and I trust that when Sir Douglas comes to this country, as he hopes to do before the end of the year, it will be possible for us to have either at an evening or perhaps at an afternoon meeting a discussion of the whole range of recent work in the Antarctic.

I have been in close touch with Sir Douglas Mawson during the time that his expeditions were in preparation and have had considerable correspondence with him at intervals when he was able to send letters home. I should like to stress the extreme interest of the region which Sir Clements Markham called "the Enderby Quadrant" to which this expedition was sent. It was the first region of the Antarctic to be discovered and about the last to be explored. Sir Ernest Shackleton in his last expedition had intended to make a thorough examination of it, but a series of disasters prevented this.

The discovery of Enderby Land was so interesting that I venture to devote a minute or two to recapitulating its history. Two hundred years ago there was founded in London a firm of merchant ship-owners named Enderby Brothers. After the return of Captain Cook from his second voyage, the Enderby firm entered the sealing business in the Southern Ocean, using a New England port as their starting point. It is interesting that two of Enderby's ships were chartered by the British Government to carry the first loads of taxed tea to the American

colonies, and they were the occasion of the great Boston Tea Party that was the signal for American Independence. The firm of Enderby produced a succession of brothers, one of whom, Charles Enderby, was born somewhere about the beginning of the last century and was an original Fellow of this Society and for a long time a member of Council. He was devoted not only to the commercial exploitation of the Southern Ocean, but also in a special way to its scientific exploration. He encouraged his skippers in the course of their whaling and sealing business to take every opportunity of making discoveries. As a business man he made most energetic efforts to recover the lost whaling trade which by the year 1849 had almost entirely passed over to America. There were then five hundred whaling ships going to the Southern Hemisphere from the United States and only fourteen from Great Britain. Enderby's effort, though not a financial success, is an example of the way in which human geography permeates the whole range of our science, because in extending the radius of the commercial geography of the Southern Hemisphere Enderby Brothers first discovered the Auckland Islands, and later established a British whaling company there. That company, though a failure, had the germ of a great idea and foreshadowed the vast Antarctic whaling industry of to-day. Enderby Brothers sent out John Biscoe in 1830 to make a voyage of circumnavigation as far south as possible. Perhaps it was the most wonderful Antarctic voyage ever made considering the small size of the ships and their very inadequate equipment for polar navigation. Biscoe discovered Cape Ann, named Enderby Land, and struggled throughout a desperate month against the most appalling odds to reach the coast. He was beaten in the task, but succeeded in getting safe back to Hobart with hardly a man in his ship able to stand. That was an example of the stuff sailors in those days were made of, and it is a great satisfaction to this Society to know that John Biscoe in 1833 received the second of the Royal Awards which were established by King William IV in encouragement of geographical exploration.

I have long been anxious to find a portrait of Charles Enderby. It has been difficult to secure one, but after years of inquiry I succeeded last week in obtaining, through the kindness of his grand-niece, Miss Gordon, a faded photograph from which a slide has been prepared. You now see before you the benevolent features of a fine Early Victorian type of London merchant and a life-long Fellow and patron of this Society. I had occasion to mention at a recent meeting when Professor Holtedahl described the work of the *Norvegia* in the Antarctic that the spirit of Enderby has been reincarnated in Norway in the person of Mr. Christensen, who has established the great Polar Museum and Institute at Sandejiord and who subsidized those expeditions of which we heard to-night as meeting and holding friendly intercourse with Sir Douglas Mawson in Antarctic seas. It is rather curious that after Enderby Land had remained unvisited for a hundred years the first people to go down there should meet with others who had gone with a similar object. The same thing happened with Wilkes and D'Urville in 1840 at Adelie Land, and I suppose there will always be similar coincidences leading, it may be, to couples of explorers coming together in our hall for interesting and lively discussion as to questions of priority and nomenclature.

I should like to make one reference to the work of Sir Douglas Mawson's ship. It is extremely gratifying to all our Fellows to know that the old *Discovery*, which was built specially for Antarctic exploration at the charge and by the instructions of this Society, should have twice again been fulfilling her original function. I saw the *Discovery* when she was a skeleton of closely articulated timbers on the slip at Dundee. I saw her when she was launched and sailed in her with Scott on her first voyage, alas, only as far as Madeira. I saw her next

when after most fascinating adventures she returned to England in 1904. After a lapse of many years spent in commercial Arctic service she was re-purchased and re-equipped by the *Discovery* Committee, and I saw her send-off to the Falklands in 1925. In 1929 I saw her with Captain Davis in the Thames ready for the far South again to pursue the grateful mission of vindicating the skill and veracity of our early explorers. The name "Kemp Land" has appeared upon charts for many years, but nobody knows anything of the discovery of that coast except that Peter Kemp, on his return from a sealing expedition in the *Magnet* in 1833—perhaps on one of the Enderby ships, but I rather think not—deposited with the Admiralty a chart of his track showing Kemp Land. In the absence of details doubts arose as to the existence of this land, which might well be based on a glimpse of Enderby Land misplaced owing to some error in longitude; but Sir Douglas Mawson has definitely proved that Kemp Land is there in its proper position as shown by one of Kemp's chronometers. It was interesting when listening to Dr. Kemp's paper in this hall in December last to note that *Discovery II* had in a similar way vindicated the surveys of Captain Cook in the matter of Candlemas Islands in the South Sandwich Group. The discovery of all those coasts includes another vindication and a most interesting one, Balleny's discovery of Sabrina Land, which he named after the cutter which accompanied the *Eliza Scott* when Balleny discovered the islands called after him. The *Sabrina* was the only vessel which has ever been lost with all hands in the Antarctic.

Every Antarctic explorer who has gone out and done good work has discovered some mistakes in his predecessors' work, and no doubt a great many rectifications will still be required on the maps. One revision which must be made sooner or later is the reallocation of names on the land which, as you saw, ran in a succession of little blobs all along the Antarctic Circle throughout the whole semi-circumference shown on the map we had on the screen. There has been a tendency for recent explorers to stretch their own discoveries a little along this string of landfalls on the Antarctic Circle and to crowd the discoveries of their predecessors into narrower limits than these explorers had claimed, and something should be done to arrive at an equitable compromise.

The question of nomenclature is a thorny one and may give rise to some discussion and difficulty; but I think the time must come before very long when some body, perhaps international and scientific, should take the matter up and arrive at a general principle for naming these lands. I hope when the time comes that one of the considerations will be to select names of a euphonious character which will fall pleasantly on the ear like Enderby Land, Mount Erebus, and Cape Goodenough; not like certain cacophonous ejaculations which have been cast forth during some recent explorations; and I hope that the British expeditions will strive to give the most beautiful names to all the remarkable features which they have discovered and mapped.

Sir Douglas Mawson is strongly of opinion that Mac-Robertson Land will form one of the best bases for access to the interior of the Antarctic continent, and it would certainly be extremely interesting and probably very valuable if an expedition could be arranged to go out and utilize those harbours where shore-parties could land with ease and ships could lie in safety during a wintering season. That, I think, is one of the most hopeful of the implications of the paper that we have just had expounded to us.

I have now only to express my great personal gratitude to Professor Debenham for the delightful way in which he has presented the paper and to Sir Douglas Mawson for those extremely striking and charming photographs which make his great expeditions so real to us.

The PRESIDENT: You have heard Professor Debenham speak as the repre-

sentative of Sir Douglas Mawson, and now I will ask him to say a word or two himself.

Professor DEBENHAM: You have given me an opportunity of saying a word as myself and there happen to be one or two minor remarks which I should like to make. The first is that I very greatly regret that not a single officer of the expedition is here. It so happens by a series of unfortunate coincidences; Captain MacKenzie, for instance, is at sea, halfway to Australia; Lieutenant Colbeck is on a course; and other officers who are on this side of the world are at the moment inaccessible.

The second point that occurs to me is that I am very thankful that this narrative has come before the Society, if just a little late in the day, because I have a feeling that a rather redoubtable expedition of its kind has not had a proper public on this side. When I say "of its kind" I refer to the fact that this was a ship expedition, and it must be realized that an expedition which does not comprise a landing party does not awaken the same kind of interest as an expedition which, like many in the past, has spent one winter or even two in the Antarctic; so that we must judge it as a ship expedition, and therefore not of the same thrilling kind as the Scott and Shackleton and Mawson expeditions of the past, when there were always great doings ashore. At the same time I think we must give a meed of praise to Sir Douglas and his men for sticking at what was a thoroughly unpleasant job. Perhaps I speak as a landlubber in saying that. On the expedition in which I had the honour to serve I was only too glad when I saw the land; I felt, "Now all is well and I do not mind what happens." But it is a fact that life in the *Discovery*, well equipped as she is, can never be comfortable in those Antarctic gales; and this expedition met very desperate weather at times. With no very spectacular aim, no Pole to reach or anything like that, it carried out its purpose in so far as the coal allowed—we must always make that proviso—very well indeed.

I am afraid, following what Dr. Mill said about nomenclature, that there is bound to be some confusion as to names in future. Those who read the American geographical journals, the *Geographic Review* in particular, will see part of the coast we have been talking about with one set of names; those who read the *Geographical Journal* in a month or two will see the same coast-line for the most part with a different set of names. That confusion will be settled, I venture to think, not, as Dr. Mill hopes, by an international body, but by public opinion as to which is the most euphonious name, which has priority, and which, in fact, is the most useful. The confusion is due to the fact that there were two major expeditions, the *Norvegia* and the *Discovery*, and there were many whaling skippers about, all very ready to see and discover new land and ready with a name or two. Thus an embarrassment of names is more or less unavoidable.

The PRESIDENT: It may sound somewhat conceited, but may I say that we in this Society will always be ready to give a lead to public opinion; if others like to come here and discuss what names should be given to newly found places they will be very welcome, and I am quite certain that the harmonious feeling which exists in this hall and Society will provide a very favourable atmosphere for such discussion.

From a professional point of view I was very glad to have heard Professor Debenham speak as he has about the sea. There are great discomforts; and I can assure you that we, the eels who get skinned so often, feel them just as much as those less accustomed to them. The only difference is that we feel them more often, and it is for that reason that we give the greatest possible praise to that determination and pertinacity which was to be expected from a man like Sir Douglas Mawson.

I do not know whether you know the story which is illustrated by the sledge

which hangs in the Society's museum. Sir Douglas Mawson and two others started towards the South. Very soon one of the party, a young Englishman named Ninnis, went through the snow into a crevasse and was lost, not only himself and his sledge but his dogs and a good portion of the best of the food. Mawson went on with his only remaining companion, a Swiss named Mertz. Later he saw that Mertz was very ill, it may have been from malnutrition; he died on January 8, and Mawson was left alone. He shortened his sledge—his dogs had by that time gone—and he dragged that sledge home 300 miles in thirty-one days. There were times when it took him five hours each day to prepare his food. The only way in which he could break his pemmican was by using the geological hammer he had with him. At one time he fell into a crevasse himself and was caught by the rope which is still attached to the sledge. He climbed up the rope, but slipped and fell to the bottom again, and he told me that he said to himself, "I have only to lie down; I shall be dead in an hour." Then some lines of verse came to his mind, and he said, "No, no; I won't do that"; he got up and managed to set off again. From a man like that one may expect anything. He has shown us by his work what the courage of a man and a leader can do.

We very much regret that none of Sir Douglas Mawson's party are present to-night. If you had heard Captain MacKenzie describe, as I have heard him, the voyage at full speed up Mackenzie Sea—he has spent much of his life at sea and has a voice which could have been heard quite well all over this hall—if you could have heard him describe with enthusiasm steaming up that sea you would have realized it was well worth while. It has been very delightful to see all the names on the map, and I am very proud to have mine—too long, perhaps—among such extraordinarily good company. I think I heard Dr. Mill use the phrase "the sailors of those days." I can assure you there is no great difference between the sailors of those days and the sailors of these days. Captain Davis, Captain MacKenzie, and those in the mercantile profession go and do the same things as they have done in the past.

As to the naming of actual places, although it has nothing to do with our subject, I wonder whether you have seen an example of how places and things do get named in a book I have recently read by Sir Hector Duff. When he and his party came across an unknown plant in Senegal he asked the natives, "What is that plant?" and the reply was "Kali," and he called the plant *Kali Senegalese*. Few knew that the word *Kali* means "I don't know"! I need not say that there are no natives in the Antarctic to whom one can apply for such information.

You heard Dr. Mill thank Professor Debenham and, in his absence, Sir Douglas Mawson on his own behalf, and I do the same on your behalf and on behalf of the Society. You may be assured, Professor Debenham, that I shall write to-morrow to Sir Douglas Mawson and tell him that, sorry as we were not to have him here, he could not have found a better substitute than yourself. You delivered his lecture in a most delightful and sympathetic fashion, for we felt all along that you regarded yourself as part and parcel of this great business of Polar exploration.

It is worth while, perhaps, though a little late, to speak one word of the future. I said earlier something about interest in the Antarctic being unabated. The interest will go on without slackening. There are now two great expeditions in preparation. They are of different kinds, but the two leaders are already in close communication with the object of further exploration in those parts of the Antarctic, and they may both be well assured that they will meet with every encouragement that we can give them from this Society. With that I thank you again, Professor Debenham, for a most interesting evening.

ALLEGED CHANGES IN THE CLIMATE OF SOUTHERN TURKISTAN: *A paper read at the Afternoon Meeting of the Society on 14 March 1932, by*

LIEUT.-COL. REGINALD C. F. SCHOMBERG, D.S.O.

THE aridity of the Tarim basin has been frequently discussed, and the following paper is based on a recent journey, in 1930–31, to the south and south-east of Chinese Turkistan. Conditions in this part of Central Asia have suggested to some geographers a certain abnormality in climate, and they have sought to prove that deserted cities, vanished rivers, and slowly drying lakes are due to a decrease in the water supply of the region.

Before proceeding further it may be well to state that all remarks in this paper refer to conditions in historical times, and it is difficult to understand how the supporters of the theories of climatic changes in this period can invoke the tectonic uplift of the Himalayas during post-glacial times, or connect the dwindling of the ice residue of the glacial period with the gradual disappearance of dead and fossil ice, and the consequent shrinkage of rivers.

The argument in this paper is that no such climatic changes have ever occurred, and that the state of southern Sinkiang gives no basis for the somewhat far-fetched arguments adduced, but is explainable by simple and natural causes. That Professor Penck, at the Society's centenary meetings, denied any such changes encourages the hope that the following observations made in 1930–31 may be of value.

The Tarim basin is a clumsy term, which might well be replaced by the word Kashgaria: but let it stand. Before proceeding farther a brief account of the Tarim basin is desirable. This basin lies between the southern slopes of the Tien Shan and the northern slopes of Kunlun, two ranges which have on these particular slopes a permanent defect in moisture, whether snow or rain, because the Himalayas in the south and the northern Tien Shan to the north impede very considerably the moisture-laden breezes from the Indian Ocean and Siberia respectively, thus limiting precipitation to local condensation for the most part. If this is realized, together with the equally important facts that the chief source of the rivers is the Pamirs and not these two mountain ranges, the problem becomes simple. The Kunlun snow supplies only two important agricultural tracts, Khotan and Keriya, and the Tien Shan only one, Kucha. The belt of cultivation from Qarghaliq westwards *via* Yarkand and Kashgar to Aqsu draws its water from outside the Tarim basin proper; and there is no evidence whatever that there has been a progressive shrinkage of these rivers.

There are three river systems south of the Tien Shan: (1) The Tarim and its tributaries which provide the bulk of the water and drain the area from Qarghaliq to Kurla; (2) the Charchan, in the south-east; (3) the Konche, which, though flowing into the Tarim and exercising a profound influence on the drainage of the basin, rises in the Yulduz valley and is free from any climatic influences of southern Turkistan.

The arguments brought up to support the theory of diminishing water supply are: (1) the drying up of Lop Nor; (2) the disappearance of the Keriya river; (3) the general changes in riverine condition in the south-east; (4) the

evidence of dead forest, dead reed, ruined cities and abandoned towns, derelict cultivation, and, in brief, many signs of lack of water all eloquent of a drier climate.

Now, if all these were really proofs that the climate was becoming more arid, they would only show that certain parts of the Tarim basin, and that not merely the smaller part but the most inaccessible and unattractive part, had been so affected. At the most it would be found that certain rivers have dried up: a very different matter from proving that the whole area had suffered a

Sketch-map of part of Chinese Turkistan

climatic change, and surely an inadequate foundation on which to raise the theory of the impetus of nations. Before dealing with the above arguments it is suggested that some easily explained causes of desiccation be mentioned and also two main characteristics of the Tarim basin.

In a previous paper it was remarked how the great mass of sand that perhaps formed the Taklamakan enabled rivers to wander uncontrolled, and how the rivers themselves were exposed to influences that militated against permanency in their courses. The argument from old sites is far from convincing, and may be most fallacious. Sites are abandoned for many reasons:

(1) disease; (2) war or rebellion, of which many examples are found north of the Tien Shan, especially on the main road from Manass to Ili, and where there has been usually no attempt at re-settlement; (3) excess of water, *e.g.* Qaraqum, south of Kurla; (4) salt in the soil; (5) dispersion, failure, or disappearance of the water, more frequently due to artificial causes than to natural; (6) better land available elsewhere; (7) sand; (8) squatting.

This last is particularly prevalent nowadays, as under present regulations a peasant opening new land is given free seed and pays no taxes for three years; and thus there is a regular practice of squatting on land and at the end of every triennial period moving elsewhere. In a land where building costs almost nothing, and land and wood are free, abandoned houses exist everywhere: so much so that it is easier to build a new house than to repair the old. Settlements are moved also because they are inconvenient. For instance, the people moved from old Domoko in the Khotan district about 120 years ago because the present site of new Domoko proved more convenient. As an old man at Domoko said to me, "We know more than we did then in the old days," referring to irrigation, shelter, soil, and the like.

It is always argued that old sites are farther from the mountains than present ones (cf. old and new Domoko), and consequently that the rivers flow less far than of yore. Yet as a general rule modern sites are far more extensive than the present settlements, and we must bear in mind that without irrigation cultivation in the Tarim basin is not possible, and the maximum is gained close to the skirt of the foothills where sub-surface water wells up.

Another example is that of old Niya. The Niya river supports a flourishing population 60 miles to the south of the old town and near its place of issue from the hills, and the river still flows within 10 miles of the old site, being towards the end considerably canalized. At times however, owing to inadequate snow in the mountains, the river fails to get so far, but there is never a shortage at New Niya, though there may be farther down, and this points to a leakage and loss of water between the two sites. Thus a defective snowfall would prevent cultivation at old Niya but would be enough for the new settlement, and the water supply of the Niya river proves that not a regular but only an occasional defect takes place. It is interesting to note that after old Niya was abandoned there was an interval of many years before the modern town was established, which for many years was a Waqf or charitable endowment for the renowned shrine of Imam Ja'far Sadiq, south of the old town. Why old Niya was abandoned I do not know; but it is absurd to pretend that climatic changes were the cause when at the latter part of the last century the present town was formed. It may have been loss of water, certainly not defect in water.

It is worth noting that the cultivators at the Niya river end complain that a very heavy snowfall prevents the water from reaching them, as the flooded stream breaks down the banks at Toghrasu, 30 miles north of modern Niya, and inundates the country. Signs of such an overflow were very evident in 1931. The people say that they at once go to repair the damage and to coax the river back into its normal channel, but while they are doing this their crops perish from lack of water, as the flooding naturally occurs at the hottest time of the year. Of course the present settlement must affect the supply to the fields at the end of the river. After examining carefully the Niya river I could

Cultivation and houses destroyed by sand at Tashmalik, near Kashgar

Keriya River, east of Tashkalik Chap

Yartungaz or Aqtash River, March 1931

Gorge of the Konche River, between Qara Shahr and Kurla

Junction of Konche and Tarim rivers

Bed of the Tarim River, Lop district, April 1931

find no evidence of climatic change, but considered the behaviour of the river in every way normal.

Another reason why sites in Turkistan are brought nearer the hills is that the people are less pastoral and more agricultural. The ends of rivers in that country are a delta of reed and brushwood, affording admirable grazing grounds, and to this day are so exploited, though in many cases suitable riverine pastures are almost deserted, which in old times carried many flocks, as at Endere.

It is doubtful if old sites prove anything in Kashgaria always excepting difficulties of culture. All the large towns are situated where canalization is possible and the Yarkand, Tarim, Kashgar, and other rivers roll to their death without a single town on their banks, and well-nigh ignorant of mankind. Sometimes, as in the case of Loulan, a town has been abandoned because a river has changed its course, though here again the river is flowing in its former bed; but as a general rule towns in Turkistan are independent of the vagaries of rivers, and the few abandoned sites that have been made to prove so much are the exception. Small isolated settlements, especially if endowed with Buddhist remains, *e.g.* Rawak, near Khotan, have been chosen rather for religious isolation than utilitarian purposes, and undoubtedly in some cases have been abandoned because the water failed.

Mr. P. S. Nazaroff, a capable Russian geologist, well acquainted with Central Asia, and now in Africa, has dealt very curtly with the abandoned sites of Turkistan. He says: "The ancient cities and civilizations of Serindia perished from the destruction of their irrigation system in war" (*Blackwood's Magazine*, June 1931, p. 790, column 2).

The face of Chinese Turkistan is littered with ruined and abandoned settlements, but in a country with a small population compared with the land available there is no incentive to combat the onslaught of nature. It is easier to yield and go elsewhere. If, as at Tashmalik, near Kashgar, a sandstorm destroys the fields and smothers the houses; or if another village taps the water supply; or if the land turns sour from too much salt in the water; or if news comes of better land close at hand; or if a garrison of soldiers is established, the remedy for all these worries is to clear out. It costs nothing, there is no one to prevent it, and so it happens. Thus it is not too much to say that abandoned sites prove next to nothing and seldom what they appear to prove from a casual survey.

Having dealt with the arguments deduced from old settlements, it is well to proceed to other factors that interfere with or menace the water supply of the country. The various "köls," or lagoons, of Turkistan have been ignored as to their influence on the geography of the Tarim basin. The köls are large pans formed either by the overflow of a river or by a change in a river's course. In the former case the river breaks its banks, floods an area, and forms a large shallow lake which persistently draws from the parent stream a large volume of water until the river subsides, when the channel between the river and the lagoon silts up and there is no flow of water except by seepage for perhaps many years.

This was the case of the so-called Lop river (really the Charchan) when in 1930 the river failed to reach the hamlet of Lop, 31 miles north of Charkhliq;

it was said that the whole river turns into a large lagoon west of a line Charkhliq–Lop-ortang, and only when this is filled and the river has parted with the majority of its flow does it resume its channel. If it is asked why the lagoon does not receive merely the surplus water, leaving the normal stream to its appointed course, the answer is that the lagoon is at a lower level than the river, and the increased flow thus diverted from its proper channel causes the latter to be filled up. The above-mentioned case of old Niya shows the damage that this process can cause.

When these lagoons are formed by changes in a river-bed (a regular but less frequent cause than by overflow) two sets of köls are formed. One köl is the old river-bed which becomes a backwater, usually of little breadth, with a tendency to decrease by evaporation and filling up as the steep banks fall in. The second series is caused by the river being unable to carve out its new course quickly enough, so that it overflows and forms new lagoons.

The general influence of these lagoons in the life of the country is considerable. They tend to form smaller subsidiary lagoons, resulting in a dissemination of moisture over a large and often desert area, enabling reed, brushwood, and trees to grow, and adding to the available pasture. At times these lagoons go quite dry, but they are generally damp enough to support acres of reed which present a remarkable prospect like some field of giant corn, swaying rhythmically in the wind, a beautiful sight with the yellow or green sweeping the blue horizon. Old köls are nearly always brackish: new ones are fresh, so that it is easy to distinguish one from the other. Lagoons which are formed by a perennial stream must be excepted from this category. The influence of these pans on the river system is noteworthy, as they are liable to deprive the feeder-river of its flow, curtail its length, and, if not detected, lead to erroneous theories as to the behaviour of the stream.

A reference to the Khotan river will throw some light on the river system that is derived from the snows of the Kunlun. This stream, formed north of the city of Khotan by the confluence of the Yurungqash and Qaraqash rivers, flows due north into the Tarim or Yarkand, but it is by no means a perennial stream, and ceases to flow from October to March inclusive. It is then quite dry beyond the Mazar Tagh ridge, and frequently above it, and the only water found in its bed is in pools close to the bank, where it is frozen hard and so preserved from evaporation.

Of the river's two tributaries, the Qaraqash dries up at the end of autumn, so far as its flow into the Khotan river is concerned. The Yurungqash river provides the water that reaches, and then very precariously, the Mazar Tagh. The difference between these two rivers is caused by the Qaraqash supplying a much larger irrigated area than its neighbour; as its water diminishes, the cultivator takes off for his own use the whole amount.

The Khotan river is thus a purely regional stream, and would never be anything else even if it received the entire flow of its two affluents, which would be unable to furnish a sufficiently strong or abundant current to reach the Tarim. The Khotan river thus exercises little influence on the Taklamakan through which it flows, and hardly anywhere is the riparian vegetation—chiefly reed and thorn with some toghraqs (*populus balsamifera*)—more than 2 or 3 miles in depth: indeed in some places the desert extends along the very

verge of the river bank. The seasonal flow however when the melting snows provide a large surplus of water, even after agricultural needs have been met, is very strong, as is shown by the curious delta at the end of the river. The old river-bed on the east is a broad, desolate, arid channel, filled with hummocks of sand piled up by the wind and bordered with fine toghraqs. No water has flowed, not even a small surplus from the main stream, since 1921, and the old bed is so silted up that even a considerable flood would be impeded in its efforts to enter the old channel.

When, in course of time, cultivation is extended in the Khotan district, there is every likelihood that this river will never, except in years of exceptional snowfall, flow throughout its present course. If it does not so flow for one season its bed will be so affected by aerial action that it will probably furrow a new course in the yielding desert—a much easier task than flowing over sand-dunes.

The reason why the Quruq Darya at Yingpan has again, after a thousand years, become a living stream is that the amount of water far exceeds that which the Khotan could ever conceivably carry.

The Keriya river, which once flowed into the Tarim across the desert, parallel to and east of the Khotan river, provides a constant subject for discussion. How often and how abundantly it flowed is not known. But one thing is certain. The abundant water east of Keriya shows no sign of local desiccation. Beyond Niya the country is dreary in the extreme, but certainly not arid, with its luxuriant reed grazing extending many miles to the north, and enabling the road to Charchan never to traverse the desert. To the south the peneplain is dry and barren, but the water-level is not very deep, and the supply good. From experience it was found that at 3 or 4 feet a newly dug well yielded rapidly a copious flow, and digging such wells satisfied the requirements of a party of ten men and twenty animals. The vegetation was universally abundant, and besides reed, there were tamarisk, toghraq, sarigh buya (*sophora* sp.), and thorns.

To continue the description of the country east of the Keriya river: it was found that the Yartungaz and Endere rivers were considerable streams even during the winter, when springs were frozen and the water supply is at the lowest. The Endere in particular was most impressive, flowing in a bed 80 to 120 yards wide, between cliffs 40 to 50 feet high, at the base of which were frequent springs. At the end of this river is a settlement of two hundred families, whilst at the end of the Yartungaz the houses only number fifty. The truth is that there is no inducement to settle in such out-of-the-way places when there is plenty of more convenient land available, and many well-off farmers have left Endere for this reason. Cultivation higher up the courses of these rivers, especially in the case of the Endere, is not possible as the rivers are too deep for irrigation. Both these rivers provide pasture for many sheep.

The above account of the country east of the Keriya river should be borne in mind when the present state of that river is further discussed.

The Charchan river is remarkable as having a basin of its own, a definite course, and an interesting end in Lop Nor, and is distinct from all other river systems of southern Sinkiang. It was a fine stream, even in March, 1931, and that it had suffered no defect in supply was evident from the abundant lagoons

on both sides. The Chong Köl, in particular, was a very large lagoon full of water, and the lesser lagoons showed that they were regularly supplied with water. The Charchan receives hardly any water from its tributaries to the east, for they flow but occasionally when some rainstorm in the hills or the melting of the scanty snow fills them. Still less are the lagoons filled to the river. The river has low banks and irrigation is possible. Indeed, the settlement of Charchan is growing rapidly, and immigrants are attracted by the good land and abundant water.

Although the Toghraq, or Desert poplar, was discussed in a previous paper, it is so constantly invoked in favour of the desiccation theory that a further reference may be pardoned. The more this truly remarkable tree is studied, the more difficult it is to discuss the causes of its growth to maturity and its death, and consequently the more hazardous it is to base any arguments on its condition. There is one thing certain. Dead toghraqs do not imply necessarily a lack of water. They may do so, they often do; but again, toghraqs are found alive where unquestionably there is no water. The explanation escapes me, though the facts are evident enough, and an investigation into the life habits of this tree, and the possibility of its introduction into other countries, would be of great value.

The following examples of its vagaries amplify these remarks. On the Yurungqash, between the Eghriyar and the Qoshlash langars, was a low ridge of sand, on which were dead, dying, and living toghraqs. There were dead toghraqs with living tamarisks growing by them, and the proximity of the Momen Köl assured enough moisture. Near Atbash, on the left of the Khotan river, about 18 miles north of the Mazar Tagh, there was a forest of dead toghraqs which have not been smothered by sand, as they were growing on the top of dunes. The water was close by, and there were no signs of flooding. Five miles from the left bank of the Tarim river, between Kunchuk oldi ("the dead bitch") and Rahman Köl, is a large forest of dead toghraqs which have a curiously whitish appearance that distinguishes them from trees which have merely lost their leaves. Although 5 miles from water, of which these particular trees need little, tamarisk, saxaul, and sophora were growing, and the neighbouring plain, equally remote from the river, carried numerous though scattered living trees. Many other instances could be given of the death of toghraqs for no apparent reason. There is a Turki saying, not unlike ours of the oak, that toghraqs take a thousand years to grow, and a thousand years to die.

I would hazard, though very dubiously and reluctantly, a few suggestions as to why these trees die. To begin with, toghraqs dislike salt efflorescence, which is often due to excess water. Secondly, the tamarisk by its rapid growth absorbs the scanty water supply, and thus kills the adjacent poplar. Dead toghraqs and living tamarisk are frequently neighbours. Third, maybe subsoil changes in the water supply, too much or too little; fourth, disease; fifth, human agency. So far the last has had but little effect on the trees, but it is increasing. Poplars are often killed by the shepherds burning off the old reed to hasten the growth of the new. Undoubtedly dead toghraqs often denote lack of water; equally they often do not. The point to bear in mind is that the state of these trees really proves nothing, and as an argument it is worthless.

This recent journey round the Tarim basin enabled me to realize still more the singularly erratic behaviour of the Tarim and Yangi rivers, but it is not necessary again to discuss this as it was dealt with in a previous paper.

It is now appropriate to deal with the questions mentioned earlier in this paper, questions which are the very life-blood of the theory that Chinese Turkistan is drying up.

Lop Nor is not drying up. I was prevented, owing to political disturbances, from reaching the lake itself, but a casual visit would have proved nothing, as examination of the sources of supply is the more desirable. The Quruq river, flowing by Yingpan and Loulan, was the chief feeder of the lake. When it changed its course and its waters amalgamated with those of the Tarim, Lop Nor did not receive the same share as before. This was because, although the Tarim did and does feed Lop Nor, the intake of the lagoon was diminished because (*a*) the water reached the west of the lake and failed to reach the part which the Quruq river supplied; (*b*) cultivated areas increased and so the supply available for the lake correspondingly decreased; (*c*) extensive lagoons east of a line north and south through Shahyar absorbed much water. In other words, Lop Nor after the defection of the Quruq received a part of that river's water *via* the Tarim, and the normal supply from the Charchan river. The lake thus decreased by the difference between the whole of the Quruq Darya and the proportion that reached it through the Tarim. Climatic influences did not enter at all into the matter.

What is now happening is that in 1931 the Tarim river had lost its fortuitous increase of water which came when the Quruq changed its bed, because that river has returned to its old channel, and is reported to reach Lop Nor in 1932. If this happens Lop Nor will receive its former quota of water. The point to bear in mind, and which seems to dispose of this lake as a factor in the desiccation theory, is that the waxing and waning of Lop Nor have nothing whatever to do, and never could have had, with its three constant sources of supply—the Charchan, Konche, and Tarim rivers. As these have never decreased in volume, and as the lake is only fed by them, how can any alteration in it be due to climatic changes?

I do not believe that the Keriya was ever a perennial river, and the analogy of the Khotan river encourages me to this conclusion regarding a much smaller stream. It flowed for a time, and then dried up, perhaps again flowing in periods of flood. The toghraqs at its northern end are nourished by the seepage from the Tarim river. It has been shown that the rivers and country to the east of the Keriya river show no signs of aridity, and it is difficult to regard the isolated case of this river, which now supplies a large arable district and thus diminishes its available flow north, as a serious contribution to the argument. Its decrease would at the most only afford evidence for a local climatic change, and that hardly a convincing one. So long as its neighbours in the west, and more so those on its east, flow with undiminished vigour, the Keriya river seems to me to prove nothing. Surely the failure of one river is not to be adduced as the proof that a vast area has suffered a climatic change.

There is next the argument of general changes, *i.e.* a diminution in the volume of the rivers of the south-east Tarim basin, but what is produced to support this? The lack of population seems to have provoked this very con-

venient theory, but at no time, past or present, have settlements in that region been other than scanty, sporadic, and insecure. It may have been the old silk route, but where are the settlements along it? Few and scattered are the remains. The reason why south-east Turkistan has been left alone is not lack of water or poorness of the soil, but a lack of amenities. Burans or dust-storms are unusually frequent, insect pests are notorious, the winters are colder and the summers hotter than elsewhere, the sand makes communication difficult, there is ample land in more favoured neighbourhoods, so there is no inducement to settle down in this dreary quarter. In spite of its remoteness, Charchan, Charkhliq, and Vash-shahri are increasing as pressure of population drives out the enterprising and energetic peasants from older settlements. There is nothing, then, in the south-east area of the province to help the desiccation theory.

The evidence of dead vegetation has been dealt with, and generally such evidence seems inconclusive.

It can hardly be hoped that the above remarks will lay, for good and all, the ghost of the desiccation theory, on which arguments and theses of a far-reaching nature have been founded. This ghost still haunts the geographical discussions of Chinese Central Asia and its phantom shrieks have driven off much valuable observation. It has even been alleged that the climatic changes of southern Sinkiang have affected or indeed caused the great human migrations of Central Asia. Both premise and hypothesis seem fantastic. So far as migrations go, if the whole of Turkistan had become as dry as its great desert, the result to mankind would have been quite insignificant.

This country has been called the land of withering rivers, a picturesque but wholly mistaken piece of imagery. There is only one river that is withering, and that is the southern reaches of the Tarim river, because it has had to give up the water that once flowed by the town of Loulan, itself often invoked by the aridity theorists. The rivers of Turkistan are fickle and untrustworthy, two Turki characteristics, but they are not withering. It is likely enough that the Yangi river will, by some caprice, return a second time to the Tarim. It certainly will if the cultivators in the lands of the lower Tarim prevail in the courts of heaven which they are deafening with their appeals for water for the ever-withering fields, just as doubtless a thousand years ago the folk of Loulan prayed for the return of their river.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH) said: Colonel Schomberg spoke to us more than a fortnight ago at an Evening Meeting about his travels in the Far East, and this afternoon he will speak to us of the climate there.

Colonel Schomberg then read the paper printed above, and a discussion followed.

Sir FRANCIS YOUNGHUSBAND: I have not really made a study of this subject, although it is a most interesting one, in spite of what the lecturer has said as regards its dryness. The problem is whether the rivers in Turkistan really do dry up and general desiccation takes place. But all I can say to you this afternoon will be merely observations that occurred to me in the course of the lecture.

Colonel Schomberg seems to be pretty certain that there is not a general

desiccation of that part of Central Asia, but I am wondering whether, although there may not be a steady desiccation going on, as it were, in a straight line, beginning with a very wet period and ending with an extremely dry one, there may not have been fluctuations—whether what is going on in Central Asia is not a fluctuation of dryness and wetness, and whether that may not have been caused by the advance or retreat of the glaciers in the Kunlun range south of Chinese Turkistan. I think all the rivers with which the lecturer dealt were running down from the Kunlun range, and I can recall that Dr. Emil Trinkler, a traveller who lectured to this Society, went up to the Kunlun range for the purpose of studying whether the glaciers were advancing or retreating. The advance or retreat, the diminution or augmentation of the glaciers, would account for the fluctuation in the amount of water in the rivers which come down from the range. Perhaps there may be a fluctuation extending over a period of ten to twenty years. That glaciers do vary is confirmed by one's experience in the Himalaya, the glaciers there advancing and retreating to a considerable extent within our knowledge. I have on various visits seen great fluctuations in the glaciers there; it may be the same in the case of the Kunlun range. It may have been going on for thousands of years and during recent historical times. That may be one cause of the fluctuation in the amount of water in the rivers.

Then, of course, there is the sand problem. The sand, while not retiring, very often advances in strange places; that may also have some effect in damming up the course of a river and turning it off into another direction. That is a point which the lecturer, in his full paper, has taken into consideration. In his recent lecture before the Society Colonel Schomberg cited the case of the forests being attacked, as he thought, by some insect pests which caused their destruction. That may have an effect also on the water supply. Then of course there may be fluctuations of population due to disease, or to war; that may also be a cause of the disappearance of cities.

The above are just a few points that struck me as I listened to the lecture. I think the point about glaciers is one that should be taken into careful consideration.

Major L. V. S. BLACKER: Colonel Schomberg has opened the door to a most interesting subject and one which consideration will show must have had a vital fundamental effect on the history of the movements of the population of the Old World through a number of centuries past. Before going further I venture to make a small contribution to the evidence on the subject, and that is that I observed some years ago coniferous trees in a valley called Bulun between Pokhpu and the Kunlun in a position which is, I think, considerably farther east than they have been observed before, north of the Himalayan axis.

I think that if one looks at the Old World generally one will observe a dry belt running obliquely roughly from north-east to south-west. In the extreme north-east is Outer Mongolia and the Gobi. Tracing it farther along you come to the Taklamakan desert, with which Colonel Schomberg has been dealing; and, still farther, the Qizil Qum, Qara Qum, and Golodni Step of Western Turkistan; and then the arid areas of Baluchistan, South Afghanistan, Persia, 'Iraq, Arabia, Sinai, the Sudan, the Western Sahara right into the Atlantic at Rio de Oro, a vast belt stretching right across two continents which it is impossible to match anywhere else in the world. There is little doubt that the dryness or wetness of the belt as a whole must have been altering during the last few hundred years. There are a number of phenomena for which it would otherwise be impossible to account. It is more than possible that the lowest point, the Nadir of desiccation, had been reached some little time ago in the Taklamakan, and we hear to-day that the humidity of the climate is now on the upward trend. I think Dr. Roy

Chapman Andrews described in Outer Mongolia a spring growth of green grass, something quite different from the scenery of which previous travellers in the last century or the century before gave one any conception.

Another point that has to be accounted for is the change in the course of the Oxus from the Caspian to the Sea of Aral, which I believe is about 150 to 200 years old. Further, there is the decay of the rich and prosperous cities of Maverunnahr and Khorezm, at the present moment sites in the country where the wells are 700 and 800 feet deep. I refer to the deserts south of Merv between Charjui and the Afghan border. I was fortunate enough in 1920 to see the remains of what must have been a section of the Golden Road between Meshed and Samarqand; that ran through what is now completely uninhabited dried-up salt-encrusted country which must in the old days have borne some vegetation and population.

Again, in Persia there is much evidence in all parts to show that a change of some sort has taken place. In Baluchistan you have, no doubt, evidence from the pages of Arrian to the effect that the Hanna valley was thickly grown over with jungle where the country is now almost waterless; water has been introduced artificially. Five hundred years ago the Emperor Akbar shot rhinoceros in the Yusafzai valley. It is difficult to find rhinoceros there now. Farther southwards and westwards you come to a country once called *Arabia Felix*, a designation hardly appropriate in view of its present state; but even here Bertram Thomas has recently described the fertility in the coastal belt, along what is, in effect, the eastern or southern edge of the great belt.

I suggest with diffidence the possibility that this dry belt is moving, and that the Taklamakan and Qizil Qum mark the eastern confines of it. Lop Nor and Keriya are now benefiting by the swing of the pendulum; the dryness is moving to the south and to the west, whilst the vegetation, which brings with it rainfall, is coming in from the east. Also, it should not be forgotten that during the last half-dozen years the Indian monsoon has regularly crossed the dry belt of the North Punjab to the Peshawar valley.

Another explanation of this cycle of cause and effect is the fact of the growth of Islam which being in its early days a non-materialistic creed undoubtedly led to deforestation, and deforestation possibly led to the diminution of rainfall and the ensuing vicious circle of denudation and destruction of vegetation and movements of population.

Mr. L. C. W. Bonacina: I cannot speak from any personal knowledge, but I would like to say that I have enough faith in the general stability of the climate over long periods to think that Colonel Schomberg is on the right lines in refusing to invoke the aid of climatic change to explain phenomena that can be explained by other factors. And yet there is something to be said for the other side. The evidence is steadily accumulating that climate is really made up of very irregular see-saw fluctuations from one century to another, which may have very important effects—rather longer fluctuations than Sir Francis Younghusband, I think, had in mind. In fact, so much evidence is accumulating to that effect that statistical meteorologists are losing their most cherished possession, that is to say, their standard averages or normals. These really do not exist to-day, and meteorologists are finding themselves in a somewhat awkward predicament, since there is no guarantee that a fifty-years' rainfall average in one century will be the same as that in another. I think there is evidence that the Caspian Sea has gone through many changes of level from century to century, and its last high phase was in the sixteenth and seventeenth centuries. Surely that points to an increase of rainfall in that period which was likely to have been pretty general over Asia. Supposing the rainfall at that period in the dry Tarim basin—where the rainfall is now only

a few inches a year—were 50 per cent. higher; though that is not much in actual quantity of water, the effect is likely to have been magnified on those Pamir mountains where the snow comes down, which is the source of most of the rivers which Colonel Schomberg has been speaking about.

Therefore the conclusion I have come to is that Colonel Schomberg is right as far as he goes, but that he should allow for the possibility of collateral effects due to the probability of the century-wide fluctuations in question.

The PRESIDENT: Colonel Schomberg, I would like to ask you a question which you can answer "Yes" or "No" to, and that is, whether you think the advance of the peak of the glaciers necessarily means fluctuation in the rivers. Perhaps you would like to answer that question now.

Colonel SCHOMBERG: No, I would not like to answer it!

The PRESIDENT: There are many others we would like to have heard to-night—Sir Aurel Stein, Mons. de Margerie, and others—and it is quite possible that on some future occasion we may be able to hear them. There is one we cannot hear, that is the traveller mentioned by Sir Francis Younghusband, Emil Trinkler. He was killed a year ago in a motor accident; a very great loss to science. He was thirty-five years of age and a man who had a power of thought and research which is not given to everybody.

As I have nothing original to add to this most interesting and, indeed, important business I would like, with your permission, to read from the Appendix of Trinkler's book entitled 'The Storm-swept Roof of Asia.' He says: "Much has been written on the subject of the desiccation of Central Asia. There can be no doubt that some two thousand years ago several of the rivers coming down from the high mountains fringing the Tarim basin penetrated farther into the desert. The Niya river was about 70 miles longer, and the Keriya, which is now gradually drying up in the sands, very probably at one time reached the Tarim basin. What was the cause of the decrease in the volume of water which used to flow in these rivers? The best answer to give is that we do not yet know. It will only be possible, with very exact observations covering long periods of time, for us in the future to state whether there has been any substantial decrease in the rainfall or in the size of the glaciers." And a little farther on he says: "The theory has been advanced that, some three thousand years ago, there was still ice left from the last glacial period, especially on the high plateaux and mountain ranges bordering the Tarim basin, and that these ice reserves have now melted. This theory, which has been put forward by Burrard and Rickmers, and which has also been accepted by Sir Aurel Stein, certainly deserves careful consideration. . . . There is no doubt that the desiccation of Central Asia is one of the most difficult problems that awaits solution in this part of the world."

Colonel Schomberg spoke of Mr. Nazaroff, and what Mr. Nazaroff said was: "The ancient cities and civilizations of Serindia perished from the destruction of their irrigation system in war." I happened to ask Sir Aurel Stein about that, but I did not use the word "war." I said I had been informed—for my knowledge in these matters is negligible—that it was possible that the water had been cut off by "political action," and there was no doubt about Sir Aurel Stein's reply, for he said: "If anybody told you that, my dear Admiral, he told you wrong," and there was an end of it.

You have opened a very important and interesting subject, Colonel Schomberg, and I ask you, on behalf of this audience and also of all the members of the Royal Geographical Society, who read your articles with great interest, to accept our very best thanks for the care and trouble which you have taken on this and many other occasions.

Professor LYDE, *who was unable to be present, writes:* Colonel Schomberg's treatment of the so-called "evidence" from dead forests and reed-beds and derelict towns and fields seems to me quite admirable. I traced that upstream movement in Western Turkistan forty years ago. There might be political ends in view, but everywhere—*e.g.* along the Kopet Dagh as well as the Hindu Kush—there was an economic retreat upstream for the reasons he gives, *e.g.* excess of water breaching the river-bank higher up, or irrigators there extending their tillage, or the downstream people themselves tending to agriculture and needing six or seven times as much water as before.

The statement that "the chief source of the rivers is the Pamirs" seems an error. The Pamir eastward drainage is almost negligible; even the Tagldumbush "Pamir" does not get its water mainly from the Sarikol. The overwhelming proportion of the Yarkand (Rastram) supply comes from east of the Shimshal Pass; you can call it Karakoram or Kunlun, but not Pamir! So, too, the overwhelming proportion of the Kashgar (Qizil) comes from east of the Qizil Art, *i.e.* from the Trans-Alai and the Terek, not the Pamirs.

I assume that every one accepts the evidence of the retreat of the cover in both regions. If so, its power to supply must be less than it once was; and it seems very probable that it is actually supplying less now, and quite certain that decrease must eventuate. But the proof of this, I agree, is to be found not in the Lop Nor region, but round the sources and in the upper valleys of the Rasham and the Qizil.

Colonel SCHOMBERG *has sent us the following additional note for publication:* Mr. W. B. K. Shaw, late of the Sudan Forest Department, kindly writes to say that he has noted action similar to that described in my paper in the desert vegetation of the Sudan. His letter reads: "I think the enclosed photograph* may be of interest to you in connection with your remarks on p. 319 of the *Geographical Journal* for April 1930. I took it in the Bir Natrun Oasis in the southern part of the Libyan Desert in November 1927. It shows—not very clearly—two groups of 'sellim' trees (*Acacia Ehrenbergiana* Hayne); those in the foreground quite dead while those in the left centre and background are alive. The former are on the lower level where the sand shows dark in places owing to moisture, the latter are raised on low sand mounds. The water-level in an adjacent water-hole is close to the surface, some 6 to 10 feet below the level of the dead trees. There are salt-pans in other parts of the oasis with a vein of salt formed just below ground-level, and it appeared to me that the trees in the foreground had been killed by excessive salinity in the soil brought about by a salt-crust forming there after evaporation of moisture. The loose sand of the mound, on the contrary, formed a 'mulch' which prevented great evaporation and consequent salinity. Under what conditions the now dead trees were once alive is not so clear; possibly the constant wind action had removed the sand from around them and formed the low dunes behind for the now living trees. The water in the well has only a very slight taste and is quite drinkable. Near by, though out of the photo, is tamarisk growing on mounds just like those in the pictures facing p. 317 of your article. I think you are quite right in your reply to Mr. Hinks on p. 322 in saying that this species is reproduced by seed."

Note.—The spelling Kara-Kash in the map was copied from several previous maps of this district in the *Journal;* it seems probable however that the name is better spelled Qaraqash (= black jade) as in the text.—ED. *G.J.*

*Unfortunately the photograph is not sufficiently clear for reproduction.—ED. *G.J.*

A NEW LOW PASS OF THE ROCKIES

PRENTISS N. GRAY

THE Rocky Mountains, viewed from the Beaverlodge district of the Peace River Plains, present a jagged range diminishing in height toward the north and increasing in ruggedness and elevation toward the south until they culminate in the highest peak in the Canadian Rockies, Mount Robson. One peak stands out pre-eminent: a broad base tapering gradually to the needle-like point resembling an Indian teepee, and so named by the aborigines. But with the coming of the white man the peak was renamed Mount Ida (elevation 10,135 feet), although the Indian guides of the region still cling to its original name. Just south of Mount Teepee, and towering 800 feet above it, is a tremendous mountain mass, surrounded by extensive ice-fields. Enveloping mists permit only an occasional view of its wedge-shaped summit. The Cree Indians call it "Kitchie," meaning The Mighty, but, as with Mount Teepee, the white man ignored the significant Indian name, and Mr. S. Prescott Fay placed it on the map as Mount Alexander; subsequently geographers knighted the mountain, and it now appears as Mount Sir Alexander. Its height we subsequently measured as 10,980 feet.

No maps of the country on the slopes of the Continental Divide north of Mount Kitchie were known to exist, and as far as could be ascertained nothing had been attempted in that region since Murray and Copley's reconnaissance map of 1892. These surveyors, who had carefully worked out the Peace River basin, designated the area to the south as "High snow and glacier peaks, unexplored." Warburton Pike in 1890 had skirted the north and west edges of this territory, and H. Somers-Somerset, in 1893, in an attempt to cross the northern section of this area from Dunvegan, on the Peace River in Alberta, through Pine Pass was reduced to killing his pack animals for food, and reached Fort McLeod almost starving. Local inquiry revealed that this country was shunned by native trappers, and that all professional guides gave it a bad name, declaring it contained no game.

When in 1926 we unloaded our duffle [stores and kit] at the Hudson Bay post on the Peace River, called Hudson Hope, we had in mind to map the mountain ranges and the rivers of this area, as well as to find the northern limits of the Rocky Mountain sheep (*Ovis canadensis*) and the southern range of the Stone sheep (*Ovis stonei*). We were interested in determining whether the ranges of *stonei* and *canadensis* overlapped and whether these sheep interbred.

Above Hudson Hope the Peace River Canyon stretches for 22 miles, an impassable barrier to further navigation upstream. A 14-mile portage at this point has been blazed by Sir Alexander Mackenzie on his trip to the Pacific in 1792–1793. McLeod, Finlay, Butler, and Pike had used this historic trail successively in the last century, and the Hudson Bay Company had supplied their north-western posts by freighting across it. The river here has kept its way open through the backbone of the Rockies; with the exception of the Liard far to the north, the Peace is the only river in North America which rises on the western side of the Rocky Mountains, cuts through the Continental Divide,

and falls into the oceans to the east and north. The sheer walls of the canyon rise from 600 to 700 feet above the water. All reports agree that there is no considerable waterfall in the canyon, although no record exists of any one having thoroughly explored its length. In this distance the river falls 272 feet in a succession of rapids and whirlpools, which are impossible to navigate.

In this region horses were difficult to obtain, but after some time we collected twenty-eight pack animals and started south. Although we followed scrupulously the usual ritual of the first day on the trail, repacking horses every few miles, adjusting packs, etc., we covered a reasonable distance that day through scattered jackpine woods and groves of aspen and cottonwood. Blueberries, saskatoons, raspberries, and chokeberries grew in profusion, and we feasted all along the trail. After passing Moberly Lake, a beautiful bit of water 9 miles long, we topped a 4000-foot ridge and descended into the valley of the Pine River. Our trail followed downstream to where it meets the Murray River. At their junction we forded, and although the water deepened until it wet the skirts of our saddles, we made the crossing without soaking a pack or swimming any of the horses. We continued over several miles of aspen flats and low ridges, until we reached a muskeg country.

It appeared to be a country of low ridges with tundra valleys spotted here and there with groves of jackpine and aspen. Across it we laid our course due south, shifting from time to time to avoid particularly swampy places. The next six days were an endless drag of repacking horses and pulling them out of muskeg. The monotony of our trip was relieved occasionally by yellow-jackets [wasps], which seemed to build their nests in the swampiest places. A buzzing swarm of wasps disturbed by the flounderings of the lead horses would soon have the entire pack train in confusion. To watch the pack animals approach the swarm with trepidation and then dash through on the run was amusing. But when it came to one's own turn it was quite a different matter, and falls in the deep mire were frequent.

Nine and ten hours a day were spent in the saddle, but we did not cover more than an average of 10 miles. Gradually we reached higher ground, but there down-timber presented a further obstacle. Evidently a forest fire had swept the country many years before; the burnt trees had been overturned by the wind and resembled a mass of jackstraws [spillikins]. Hacking a trail through this tangle was tedious work. Horses were constantly down, lash ropes were pulled loose and packs dragged off by the snags on the few standing dead trees. These 60 miles of muskeg and down-timber gave a complete answer to why the Indians and local guides had never gone into this country.

Finally, on the sixth day, we reached the head of Kinuseo Creek, a tributary of the Murray River. From an elevation of about 4000 feet we saw to the southward gently sloping, timbered ridges, reaching up to the ice-fields and rugged prominence of Mount Kitchie and Mount Teepee. To the south and west of us stretched the crown of the Rockies. Snow lay on the peaks, as evidently the rain we had experienced during the past few days had fallen as heavy snow in the higher mountains.

The green-timber country promised an end to bad trails. However as if reluctant to let us leave its grasp we had more encounters with muskeg, which nearly cost us four horses. Two at the head of the pack train appeared suddenly

to step off solid ground and sink into the mire up to their heads. Their floundering soon created a pool, and to our horror we discovered that the panniers, slowly filling with water, contained our camera supplies and surveying instruments. The men worked fast to unpack the horses, and by vigorous tugging of head and tail finally dragged them on to solid ground. Meanwhile two other horses, wandering from the trail, had bogged down, and only their heads were visible. After we had them all out we made camp on the first bit of high ground, thoroughly glad to have that stretch of muskeg behind us. But we were kept from our beds by a gorgeous display of Northern Lights. Green shafts flamed and flared across the dark sky, with the moon three-quarters full hanging over snowy peaks.

In 1914 S. Prescott Fay, in skirting the north-western edge of this territory, had located a waterfall of considerable height in the Murray River which he had named Kinuseo Falls. We were anxious to check this location and to make a motion picture record of the fall. We estimated the distance from our camp at not more than 12 miles, and thought we could back-pack sufficient supplies for an overnight trek. So three of us left camp with a meagre supply of six sandwiches and some tea. As our cameras made a full load for each of us we dispensed with blankets. Our course lay due west toward Vreeland's Glacier, a blue spot high up on the crest of the Rockies. Before night we covered at least 12 miles, but seemed no nearer the Murray River and the falls than when we left camp. The next day we crossed a section of country covered with down-timber so dense that often for a mile our feet did not touch the ground. Progress was made by jumping from one fallen log to another. Five miles was the most we could cover that day, and we spent our second night in the pouring rain under a spruce tree. On the third day however we reached the valley of the Murray and worked downstream to the top of the fall where it plunges into a rocky gorge. The great river, now swollen by three tributaries from the west, poured over a series of shale ledges which extended across its bed, then made a sudden drop of 235 feet to a deep pool on both sides of which rose bleak cliffs seeming to frown on the river for having escaped their grasp. From the pool the river took up its peaceful way around a timber-covered island lying directly in front of the fall.

In our exaltation at reaching the fall we boiled our last tea-leaves (which already had been boiled three times). The trail had presented such a succession of windfalls and muskeg requiring constant effort in stepping up and down that our strength was gone and out tempers frazzled. The next morning however all was forgotten in our joy in photographing the fall. Fortunately we had clear weather to locate its position by tying it into the higher peaks seen from our base camp. On our return we sought the higher ground away from the river bed and succeeded in covering in two days the distance that had taken us three in coming out. On the afternoon of the second day we shot a young grizzly in rather exciting circumstances in the thick bush, and soon steaks were frying over the fire to provide our first meal in several days.

When we reached our base camp we found that the pack train had moved on, but some supplies and our blankets had been left for us, and even our stoical Indian let out a whoop of joy at sight of them. The camp was just a cleared space in the windfalls by a muskeg pool, and originally we had not

thought much of it. But the sight of food and blankets under the tarpaulin changed our opinion. We caught up with our pack train the following day, where it was camped in real game country just east of Wapiti Lake. The hunters of the party had already obtained excellent specimens of goat, caribou, moose, and grizzly bear. We spent several days here recovering our strength and working over our camp equipment which had been considerably damaged by the long pull through the muskeg.

We were now fairly in the centre of the country marked on the map " High snow and glacier peaks, unexplored," and found it a beautiful timbered country of pleasant wide valleys and high ridges topped, even in late August, with fields of snow and an occasional small glacier. The timber extended upward to about 4000 feet, running into a scraggy growth of spruce. We saw nothing to indicate that this area had been visited before. Of course it is always doubtful whether there is a foot of the American Continent to-day which remains untrodden by Indians or trappers, but almost always they leave traces of trap lines, or axe cuttings on the obviously easy routes through valleys or low passes, and here we found no such indications.

As we travelled through this unmapped section we experienced the expectancy of the first explorer. We could not hope to find mountains of any great height which had not previously been located, as the country surrounding this blank is well known to sportsmen, mountain climbers, and Government surveyors. But our discovery of a 150-foot fall in the Red Deer Creek gave us great pleasure. From our permanent camp two Indians were sent out to try to locate a trail through the high peaks that form the backbone of the Rockies. Returning after five days the Indians reported finding a passable route up the valley of the Red Deer Creek and then through a low pass to a stream which they could not identify, but which they thought emptied into a lake on the eastern slope of the Continental Divide. We started south the next morning.

We passed out of the valley of the Red Deer Creek and made our way through a fine forest of tall trees, through which the sunlight filtered on to a grass-carpeted ground. There was little down-timber and practically no underbrush. We followed a game trail headed in our direction, because doing so gave us a comfortable feeling of travelling along a definite route. Camp was made in an open meadow beside a stream flowing north-west through a beautiful park-like country where numerous caribou could be seen quietly feeding. In all my hunting in the Canadian Rockies never have I seen a more beautiful valley. The stream, which we named Muinok (in Cree dialect, a peaceful, pleasant place), meandered through long meadows between clumps of timber that gave the valley the appearance of a cultivated park. Farther downstream a dense growth of dark spruces extended across the valley from rim to rim and even in places up the talus slopes, binding together the surrounding peaks which towered 2000 feet above the stream.

We found here our first sign of the Rocky Mountain sheep, the northern limits of whose range we were trying to locate. Soon after we located twenty-six of this species high up on a rim, and after a careful stalk killed two splendid rams. The sheep were so unused to man that they paid very little attention to us, showing none of the suspicion and wariness which makes this trophy the

Fording Wapiti River

Beside the Sherman Lakes, Gray Pass

Gray Pass: South Sherman Lake

Gray Pass: South Sherman Lake

most prized possession in North America. As they were so easy to approach we decided to remain in these pleasant surroundings to take moving and still pictures of sheep. We constructed a blind close to the top of the rim, directly above what seemed to be the sheep's bedding ground, and although it was a difficult task to carry the heavy cameras to this height we were well rewarded. Before long a number of rams, ewes, and lambs came within range, and for three hours we watched them at close range entirely unsuspicious of our presence.

Reluctantly we started south again on our search for a pass through the Continental Divide. At the headwaters of the Muinok River we came up against a precipitous mountain mass which offered scant possibility of a way through. We turned to the east, crossing over a fairly low divide toward the headwaters of a river which we subsequently found to be named the Narraway on the boundary survey maps. Following this stream in the direction of the Continental Divide we found a low pass, tucked away in a dense growth of spruce timber only 4250 feet above sea-level. This pass looked more like a ranch than a pass at the top of the Rockies. Set down in its wide meadows was a chain of three lakes which we named Sherman Lakes. When the ice is melting on the extensive glaciers that overhang the northern rim they flow together, but at low water the southern lake drains through Barbara River to the Fraser and thence to the Pacific. The other two lakes form the source of Narraway, draining through the Peace to the Arctic Ocean.

We could not resist the temptation to loiter here through a few delightfully warm days of September. Frost had splashed the hillsides with gorgeous autumnal tints; numerous caribou afforded ample fresh meat and blue grouse, spruce hens and trout formed a welcome change of diet. The surveyors were anxious to close their theodolite and stadia traverse which they had carried along for 180 miles without a check. Wagers were made about camp as to the error we would find in their work, but we all were delighted when the traverse closed on a Boundary Monument with an error of less than three-tenths of a mile.

We moved our camp 12 miles to the base of Mount Teepee, where we found in the Jarvis Pass a chain of four beautiful lakes, sketched by Mr. Prescott Fay about 1914, fed by the perpetual snows and ice-fields of Mounts Teepee and Kitchie. These lakes were the principal source of the Barbara River, and so we called them Barbara Lakes. They were connected by short stretches of river and extended over $4\frac{1}{2}$ miles, although in their widest spot they were not more than half a mile across. We continued our course down Barbara River, which descended in a series of cascades past the foot of Mount Teepee. The river, after dropping 1600 feet in 10 miles, reached the small stream which drained Sherman Lakes to the south, and, after another 12 miles through an ever-widening valley, it joined the McGregor River which drained the south slopes of Mount Kitchie.

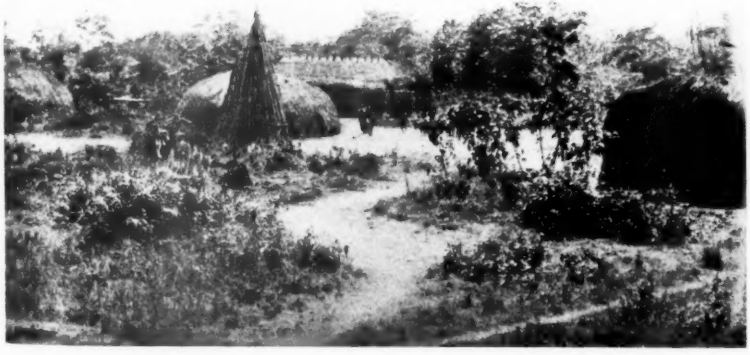
Seven miles south-west of this junction a low divide opening southward connected with a small stream (the Clearwater) which is part of the Torpy River. This in turn drains into the Fraser River near Dome Creek on the Canadian National Railway, and here we closed on a monument of the "timber limits," and ended our traverse of the long trail from Hudson Hope.

Since we found the low pass at Sherman Lakes the surveyors have been studying the possibility of a feasible railroad grade through this pass, down the Narraway River to its junction with the Wapiti and thence to the present railhead at Beaverlodge. For many years expeditions have been expending time and money in a vain effort to find a low pass to the Pacific for the vast quantity of grain grown in the Peace River district, without first having to haul it as far east as Edmonton.

From Sherman Lakes the Narraway River, after a precipitous 135-foot fall, flows north-east for 16 miles with a swift current, but few rapids. Mountains slope gently on either side to the valley, nearly a mile wide, where open meadows alternate with jackpine and spruce forests. Then for 14 miles the river winds more to the east through a wider valley to within 4 miles of the Alberta–British Columbia boundary. Here the hills crowd in and for about 8 miles the land is quite rugged. Six miles east of the boundary the river turns north. Here the bottom lands, nearly a mile wide with timbered and grassy slopes to the rolling country above, continue for 30 miles until the stream joins the Wapiti River. In the entire 60 miles of the Narraway River Valley there is only the one stretch of 4 miles on either side of the boundary which exhibits any degree of ruggedness.

We found that it would be possible to construct a railroad line crossing the Wapiti River near the provincial boundary, and continuing up the Narraway River to Sherman Lakes. The entire distance of 165 miles from Beaverlodge, Alberta, to a junction with the Canadian National Railway at Dome Creek presents no engineering difficulties, and a railroad could be constructed at most moderate cost, with a ruling grade of five-tenths of 1 per cent. for southbound traffic. Some day undoubtedly a railroad will destroy the gorgeous beauties of this last bit of the Canadian Rockies to be mapped, and the rare quiet and peace of its mountain lakes will vanish. A few of us will be thankful that we were permitted to see the undisturbed glories of the land before this comes about.

The Kuluene above the mouth of the Kuluseu



Yawalapiti, a typical village of the Kuluene region

West bank of the Kuluene: point from which Fawcett embarked in Kalapalu canoes

Mr. Petrullo with his Kalapalu informants: the two larger men ferried Fawcett's party across the Kuluene

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THE FATE OF COLONEL FAWCETT

BY the courtesy of the Foreign Office and with the consent of the author we are permitted to publish these statements by Mr. Vincenzo Petrullo which he furnished to the British Consul-General at Philadelphia:

Current interest in the story reputed to have been told by a Swiss "trapper" concerning the whereabouts and fate of Colonel P. H. Fawcett urges me to make public some information gathered in Matto Grosso while engaged in archaeological and ethnological field studies for the University Museum during 1931, in co-operation with the Matto Grosso Expedition. On one field trip to the headwaters of the Xingu River, becoming aware that I had unknowingly followed Fawcett's trail, I collected what information I could from the Indians who were supplying me with the ethnological data that I wanted. Mr. Arthur P. Rossi, who was with me at the time, made careful photographic records of the Indians and localities involved in the story.

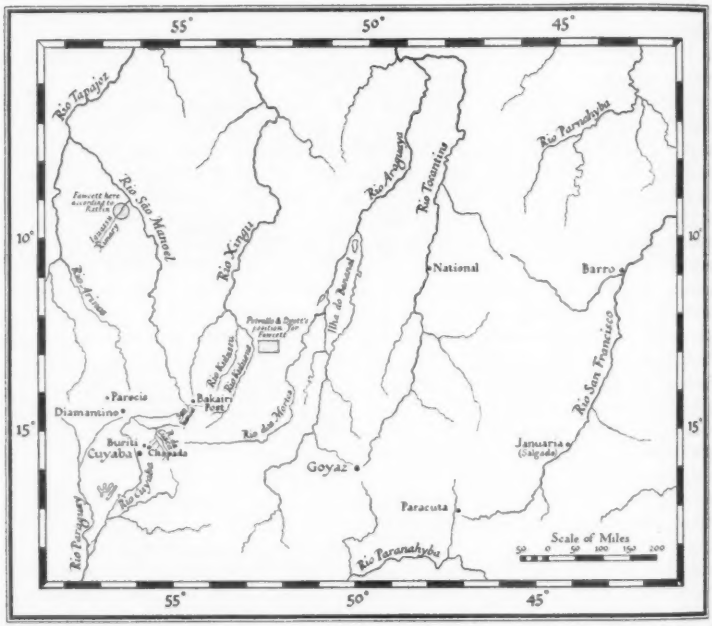
Although I always denied having any intention of conducting any organized search for the lost English explorer, both before leaving New York and up to the time that I left the last frontier town of Matto Grosso, I was pressed with queries and entertained by numerous gentlemen with stories and theories which claimed to solve the mystery. I jotted a few of them down, and now, in glancing over my notes, I discover that in almost every case the story-teller was a European immigrant, adventurer, who generally claimed to be perhaps a scientist, an explorer, or engineer, doctor, etc. Though in newspaper reports these men appear to have had many years of experience in Matto Grosso, all of them without exception have never been outside of the modern towns in the southern part of the states, or some nearby ranch. A number of these men claimed to have had personal encounters with Colonel Fawcett, who is generally represented as having a long beard and being dressed in animal skins, etc.—in short, all the traditional accoutrements of the white man lost in the wilds. Furthermore, Colonel Fawcett seems to possess the extraordinary ability of being in many places simultaneously, for he is reported to the east, to the north, west, south of Cuyaba, at localities separated at times by as much as 1000 miles. For instance, according to the author of a recent book dealing with a trip across the Bolivian Chaco, news of him was obtained in that region, though it is known that his last trip was to the headwaters of the Xingu, some 800 miles to the north-east in a straight line. The fact that in passing from one region to the other one has to traverse civilized territory of course does not seem to make any difference. In the current story it is reported that he was seen in the region between the Tapajoz and the Madeira rivers. The two rivers are separated by some 500 miles of forest.

It is significant that although I had numerous conversations with Brazilian officials, especially those connected with the Inspectoria de Protecção dos Indios —Indian Service—(the only men who have penetrated beyond the frontier towns to any extent with the exception of one or two foreign explorers, and the only men permitted by the Government to come in contact with the aborigines), I find in my notes no account of a personal encounter of one of these men with Colonel Fawcett after he left Cuyaba.

What information exists can be gathered from a number of sources, namely, officials and employees of the Inspectoria, and the Commisão Rondon; officials and employees of the Casa Orlando at whose ranch, Laranjal, Colonel Fawcett stayed on numerous occasions after returning from some field trip; from the Bakairi Indians collected in a village at Simoes Lopes, the Inspectoria's outpost which is not a fort but a school, Anahukua Indians on the Kuluseu River, and

Kalapalu Indians on the Kuluene River, both rivers being tributaries of the Xingu. Undoubtedly Indian tribes living between the Kuluene and the Rio das Mortes could add to the story, but no one has been in touch with them.

I realized that I had been following Colonel Fawcett's trail when some Kalapalu came to me to tell of the visit and departure of three white men a number of years ago. That having been the second time that outsiders had come into their country the incident was clearly remembered. Briefly, they told of three white men who arrived at their village in the company of some Anahukua Indians who had guided them from their village on the Kuluseu to the Kalapalu, a march of four days. The white men carried packs and arms, but no presents for the Indians, such as I had. The Kalapalu gave them food, biiju and fish, and in the morning,



Sketch-map of Matto Grosso to illustrate the reports of Mr. Petrullo and Mr. Rattin

having failed to dissuade the leader, the older man, from his project, they ferried the three men across the Kuluene River. It was explained to the Indians that by going east a large river would be reached where large canoes could be found which would take the party home. The younger men were ill and were suffering from Borachuda sores, and apparently were reluctant to go any farther. Subsequently for five days the Kalapalu saw the smoke of the travellers, who apparently were blazing a trail through the high grass. It is presumed that on the sixth day they reached the forest to the east, for the smoke was not seen any more. Later a party of Kalapalu in search of piki found traces of the camps made but not the white men.

This story was told in Kalapalu, aided with pantomime for my benefit, by two

of the men that ferried the white party across the Kuluene. Two of my Bakairi canoemen understood the language and the story was translated in Portuguese to me. Mr. Rossi and I checked the story in every way possible. Later, on the arrival of our plane, we had occasion to fly over the region east of the Kuluene and were able to check the smoke incident of the story.

From the Anahukua and my Bakairi I was able to gather the details of the first part of the journey of the three white men. I was given even a description of the oxen that Fawcett used in travelling from the Bakairi village to the Kuluseu, where his Bakairi guide built canoes for him.

In the major episodes my information corroborates the story of Dyott, who searched for the lost explorers in 1928. However the theory that the Anahukua killed Colonel Fawcett cannot be held, since he reached the Kalapalu safely, and thus being outside of Anahukua territory he could not have fallen victim to that tribe.

A few words about the aborigines and the country may not be amiss. Both are little known. The aborigines—I made contact with twelve tribes—are not cannibals, nor are they head-hunters—traits which incidentally do not necessarily imply "badness." As long as they are treated as human beings and are shown respect for their customs, no harm is to be expected from them, but if ill-treated they will fight with enviable courage; an exhibition of which was given us on the occasion of our flying over one of their villages for the first time, when the men instead of running away fought the aerial monster with the only weapons that they have, the bow and arrow. We found them very hospitable, generous, honest, solicitous about our welfare, and anxious not to be in our way, and immensely curious about our civilization. Had we been able to converse in a common language instead of merely pantomime and through interpreters, we would have spent many hours in conversation. They made good hosts, good guests at our camps, and good travelling companions.

The explorer must take his food with him, since game is scarce in the country, and the forests, where there are forests, do not contain much which is edible. Water is equally difficult to find away from the rivers, making necessary a guide if one wishes to leave the waterways.

(*Signed*) VINCENZO PETRULLO

It is important to note how closely this story obtained by Mr. Petrullo from the Kalapalu Indians (Kalapalos of Dyott) confirms the story which Mr. Dyott obtained in their country (*Journal*, vol. 74, p. 532, December 1929) from Aloique, a chief of the Anauquá (Anahukua of Petrullo), who had guided him to the Kalapalu, and also from a chief of those people (p. 530). The chiefs agreed that Fawcett and his two companions had crossed the Kuluene and travelled four or five days eastward. They differed in that Aloique suggested that Fawcett had been killed by Suya Indians, and the Kalapalu chief that he had been killed by Anahukuas. Dyott suspected Aloique himself; but this man was already east of his own territory when he took Fawcett to the Kalapalus, and Mr. Petrullo doubts the possibility of Anahukuas being responsible for anything east of the Kuluene. Aloique however claimed to have been there, if we can be sure that Dyott was successful in interpreting the sign language.

In any case we have now independent testimony that the Kalapulu story puts the last known camp of Fawcett some five marches east of the Kuluene about lat. $12\frac{3}{4}°$ S. and long. $52\frac{1}{2}°$ W., that is, some 100 miles west of the Rio das Mortes, in the latitude of the south end of the great Bananal island of the Araguaya.

For this country an expedition led by Mr. Churchward has recently left England. He is accompanied by Mr. Roger Pettiward, Mr. Peter Fleming, and Mr. Skeffington Smyth, and will be joined in Brazil by Captain Holman and Mr. Priestley. An account of their project, with an interesting discussion of the Fawcett problem, was given in *The Times* of June 17. Their principal object is to explore the Rio das Mortes, but they naturally hope for the good fortune to solve the problem also.

Meanwhile Mr. Stephen Rattin has returned, we understand, to Matto Grosso with the resolve to find and bring back the elderly European whom he saw detained by Indians some 400 miles to the north-west of the above position. In the May number of the *Journal* we gave very briefly the substance of Mr. Rattin's report to the British Consul-General at São Paulo, as told in the Press. Later and more complete reports, communicated to our President by the courtesy of the Foreign Office, leave the question of identity quite unsettled, though it is clear that several men who knew Fawcett best, and who cross-examined Mr. Rattin, were impressed by details of his story. Mr. Rattin says that he passed through Barracão Barreto, on the river Juruena, in the middle of September last, and after crossing the Rio São Thome, kept north of the Serra Morena, until he reached the valley of the São Manoel, when he turned south and eventually came to the Iguassu Ximary, its tributary. At the confluence of this river with an unnamed one, several miles south-west of the São Manoel, he came upon the elderly European, detained as a hostage, who said he was an English Colonel, asked him to report his captivity to an English Consul, and to a Major Paget, who had a coffee farm in the State of São Paulo, said that his son was sleeping and wept, showed him a gold locket with a photograph of a lady and two children, displayed four gold rings of which one seemed familiar to Fawcett's friends, but is not reported as ever giving his name or evidence of identity, or as sending any message to any one other than to Major Paget. Mr. Rattin states that he never heard of Colonel Fawcett until he arrived *via* Goyaz at Barreto (evidently Barretas, south of the Rio Grande, a railhead north-west of São Paulo; not the Barreto above). But having heard of Fawcett he identified him so naturally with the elderly man in captivity that the reports usually say "Fawcett" when they should say "the unknown man in captivity," and this has tended to make the story better substantiated than it seems to have the right to be. Mr. Rattin has with him a newspaper correspondent from whom, up to the time of writing, one message of no importance has come.

The position then is that Fawcett's last camp east of the Kuluene, as reported by Mr. Dyott, has been confirmed by Mr. Petrullo. It is some 400 miles from the place where the English Colonel was seen by Mr. Rattin. The distance is nothing surprising, when we remember that the last news was more than six years old.

REVIEWS

EUROPE

THE ROADS OF ENGLAND. By R. M. C. ANDERSON. *London: Ernest Benn, Ltd.* 1932. $7\frac{1}{2} \times 5$ *inches;* 240 *pages; sketch-maps.* 8*s* 6*d*

Miss Anderson has not attempted to write that detailed history of English roads which will require perhaps the co-operation of topographers, archaeologists, historians, and economists—in fact, she definitely disclaims for her sketch the title of an "academic treatise." Her purpose is to appeal to the wide public which is making increasing use of the roads, in whom she sees, with enthusiasm, the inheritors of the tradition of Chaucer's pilgrims. The theme is the unbroken development from primitive trackways to the modern trunk roads. There is however no convincing evidence for a great organized system of tracks in prehistoric times, or for the utilization of them by the Romans to any considerable extent. The common features which the systems possess throughout are due largely to the early and continued predominance of London and to the main topographical features of the country. Her best chapters are those in which she describes the chaos into which the roads fell between the Roman period and the eighteenth century, and those in which she places the roads in relation to the social life of successive generations.

The cartographical references are frequently inaccurate, especially in the chapter on road books. The latter might have been corrected and extended by a wider use of the writings of the late Sir George Fordham. Though mentioning the Ordnance Survey map of Roman Britain, the writer is unaware of the map of Stuart England, in the same series. Incidentally, it is twice stated that the first Ordnance Survey maps appeared in 1890. The book is illustrated by a number of indifferent sketch-maps, and is one of those irritating productions in which nearly a quarter of the pages are blank. G. R. C.

THE WESTERN HIGHLANDS (The Scottish Mountaineering Club Guide). By JAMES A. PARKER. *Edinburgh: The Scottish Mountaineering Club* 1931. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* vi + 134 *pages; illustrations and map.* 6*s*

This book is a guide to the mountains and the hill paths of the Western Highlands of Scotland, dealing with that portion of the mainland which lies west of the Caledonian Canal and south of the Dingwall and Skye Railway. It gives a description of nearly one hundred mountains and the principal routes up them, together with some fifty cross-country hill paths. It is illustrated by a large number of excellent photographs, while the key-map to the letterpress, though on a small scale, is well printed. The very full index is all the more notable on account of the large number of Gaelic place-names included, and there is an interesting glossary of many of the more important of these, the spellings given being those used in the latest edition of the Ordnance Survey maps.

No fewer than sixty of the mountains in the district covered exceed 3000 feet in height, while many of those in the northern portion are little short of 4000 feet. It is a region deeply trenched with valleys whose scenery is of great beauty, while the mountains themselves are as a rule steeper and more pointed than those of the districts east of the Great Glen. Indeed, the author claims that the three great northern glens of Affric, Cannick, and Strathfarrer are the most beautiful in Scotland. So much of the mountain sides is devoted to sport, chiefly deer stalking, that, apart from the roads and right-of-way paths, large areas are out of bounds during the shooting seasons. But throughout the spring and early

summer, which form the most favourable period for the climber, he is virtually free to walk wherever he will.

A fascinating chapter is devoted to the wanderings of Prince Charlie after the battle of Culloden, most of which led him about the district here described. The fact that the volume under review is the work of Mr. J. A. Parker, a Scottish mountaineer of wide experience and varied interests, is a guarantee of its accuracy and completeness, so that no one trusting to it will have any excuse for losing himself within the region with which it so thoroughly deals. W. W.

THE ENGLISH TRAVELLER IN FRANCE, 1698–1815. By CONSTANTIA MAXWELL. *London: George Routledge & Sons* 1932. 8½×5½ *inches;* x+302 *pages; illustrations and map.* 15*s*

Miss Maxwell must have found it no light task to search through numerous travel books of the eighteenth century for the extracts she prints here—but her readers will be grateful to her for her pains. Accounts by eye-witnesses—even though a perusal of this book does not strengthen the conviction that spectators always see more of the game—have usually individual twists which bring a period suddenly to life, in a manner that few histories can. This volume would indeed serve as an excellent companion to a history of the French Revolution—but it has, as perhaps would be expected, little geography. Few of the writers do more than mention their impressions of the state of agriculture gathered from the coach window, or the prosperity of the towns they passed through, Arthur Young and Edward Rigby being exceptions. Most of them record a greater or lesser degree of surprise on discovering that the French were not the savages they imagined, descant upon the rival attractions of London and Paris, and sing the praises of French society. It is significant that most of them were struck by the gulfs between the nobles, the mercantile classes, and the peasants. On the whole, their evidence supports the view that revolutions are brought about in times of reviving prosperity, rather than in periods of abject misery. Tobias Smollett is here given due credit for foreseeing as early as 1765 the approach of a revolution—a prophecy which forestalled the elder Mirabeau's warning of the "culbute générale" by ten years.

However the springs of the French Revolution hardly lie within the domain of geography. There are several interesting accounts of travel on inland waterways, particularly on the Rhone, and Miss Maxwell has added a list of contemporary works of travel, and a map, which would have gained in interest had the roads been added from the "Livre de Poste." G. R. C.

LA NAVIGATION INTÉRIEURE DE LA HAUTE ITALIE. (XVème Congrès International de Navigation.) *Rome: Italian Ministry of Public Works* 1931. 12½×8½ *inches;* viii+232 *pages; maps and plans*

This bulky volume, packed with general and technical information of great interest and importance, including charts, diagrams, and maps, lends itself with difficulty to any tersely effective summarization of its contents. The treatment ranges over a field so wide as to comprise matters of geographical, geological, meteorological, economic, engineering, historical, legal, and political interest. Very briefly, it is an exhaustive account, from official sources, of all that appertains to the internal waterways, natural and artificial, of the large area lying between the Alps and the Apennines and extending from Piedmont in the west to the Adriatic in the east. The volume has been compiled under the auspices of a Committee, of which Professor Ing. E. Coen Cagli is the President, appointed by the Italian Ministry of Public Works. The Committee have had the co-operation and assistance of the two hydrographical departments exercising jurisdiction in the area, viz. the Magistrato alle Acque and the Circolo d'Inspezione per il Po.

There are only three chapters. The first, drawn up by Signor E. Cucchini, retired Senior Inspector of the Genio Civile, consists of an historical and legislative résumé of the development of navigation in Northern Italy. The second deals with the river Po, and the third embraces all the remaining rivers and natural channels, artificial waterways, and lacustrine ports, lying between the Po and the Isonzo. Undoubtedly the outstanding feature of individual interest in the volume is the section of forty-six pages accorded to the Po, the greatest of the Italian rivers and the main artery of navigation and waterborne transport in Northern Italy. Recent researches all go to confirm the acceptable hypothesis that in Pliocene times the basin of the Po constituted an arm of the Adriatic, forming a deep and expansive gulf, penetrating far into the interior of the peninsula. The present great Lombardy plain clearly owes its origin to the action of meteorological agencies on the slopes of the mountain chains which form the boundaries of the catchment area. The detritus brought down by mountain torrents gradually filled the deeper depressions and the process of accretion continued until the basin was levelled with alluvial deposit, through which the Po made its way to the sea. Taking its rise on Monte Viso, at a height of about 2000 metres above sea-level, the river now flows at first eastwards as far as Saluzzo, then northwards (the text says "direction de l'ouest," but this does not agree with the map) to Turin, where, once more, it turns to the Orient and pursues an easterly course with various meanderings which brings its length up to a total of about 700 kilometres, until it reaches the Adriatic through a series of mouths designated respectively from north to south: Po di Maestra; Po della Pila; Busa del Bastimento; Po di Tolle, di Gnocca, and di Goro. Altogether, the delta has a superficies of 581 square kilometres.

The annual cycle for the main stream comprises two periods of flood in the autumn and the spring, and two periods of low water in the winter and the summer. The autumn floods are productive of deposit in the bed of the river, due to heavy rains falling on the Apennines; whereas in the higher regions of the Alps the precipitation takes the form of snow, which does not melt till the following spring. Clarified by their course through the Alpine lakes, the spring floods serve to sweep away the autumnal deposits, and so by a fortunate natural alternation, the regimen of the river is maintained in a condition suitable for navigation. In the present state of the river, the most important navigation is effected between Cavanello-Po on the coast and the mouths of the Mincio, through which, by means of that tributary, it is possible for vessels of 600 tons to reach the town of Mantua. An important programme of development works is in hand, and when it is completed there will be a continuous line of waterway between Milan and Venice, a distance of 385 kilometres, navigable by boats of the above calibre.

The remaining section of the volume covers the area within the jurisdiction of the Magistrato alle Acque, and includes a detailed description of works recently executed and of schemes of future improvement. The whole constitutes a record of internal waterway development which is in the highest degree creditable to the Italian nation and the respective authorities in charge of the operations.

B. C.

ASIA

BATAVIA: eine tropische Stadtlandschaftskunde im Rahmen der Insel Java. By KARL HELBIG. *Bad Segeberg [Hamburg: Friederichsen, de Gruyter & Co.]* (1930). 9 × 5½ *inches; 192 pages; illustrations and maps. M.*4.50

Dr. Karl Helbig's German monograph on the capital of the Netherlands East Indies is a study of an island town in the tropics which has been for three centuries

a centre of Dutch colonization. The place could not have been worse chosen for a town, since its harbour is artificial and situated miles from the town, and the old town is built on the ruins of the native town of Jacatra in a morass which in a wet monsoon is inundated by the swollen Tji Liwoeng. To cope with the overflowing waters a system of canals was built which is still a feature of the town. Its impure drinking water caused the mortality in the town to reach terrifying figures in the eighteenth and first half of the nineteenth century. It was only in the eighteen fifties that water was carried from the mountains through an aqueduct to give a supply of absolutely pure water. The extension of the town on gradually rising ground towards the south did not begin until the beginning of the nineteenth century, after Marshall Daendels had caused the ancient castle and ramparts to be levelled and a number of old houses to be pulled down.

The author treats the place as part of the island of Java and includes a description of the geography of Java, its climate, the soil, plants, animals, and races who live there. He adds a short history of the Dutch colonization in the Indies and the part which Batavia has played as the centre of Holland's power, wealth, and strength. Lastly, he adds a comparison of the town with towns in our own climate.

The book is illustrated with many views of the town, maps, and ground-plans, and is altogether a thorough study of an interesting and unusual subject.

W. R. B.

MANCHURIA: Cradle of Conflict. By OWEN LATTIMORE. *New York (and London): The Macmillan Company* 1932. 9×5½ *inches;* xvi+312 *pages; maps.* 12*s* 6*d*

At the present juncture any new light on Manchuria comes opportunely. Mr. Lattimore's previous travels in Mongolia are fresh in our memories and we expect an instructive record of his latest researches and are not disappointed. The author and his courageous wife spent nine months in diligent investigation in Manchuria. Six months' preliminary study, anthropological and other, at Harvard, and subsequent delving into Chinese tomes, had prepared him for his task. The author's intimate acquaintance with the Chinese ("Mandarin") language is apparent. Incidentally, these studies lend a somewhat academic flavour to his book.

In the compass of a brief review it is impossible to do justice to the wealth of information contained in this scholarly work which is a real aid to comprehension of the present perplexing problems of the Far East. Few aspects of the life of Manchuria are left untouched. The physical and political geography of the country, its early history, ethnography, the psychology of Chinese, Manchu, and Mongol, the respective reactions of Japan and China to the impact of the West, foreign aggression and, particularly, the Sino-Russian Conflict of 1929, are lucidly dealt with; also such sociological matters as standards of living, status of women, colonization, official exploitation, and banditry. A final chapter deals with the place of Manchuria in world affairs.

The chapter on Communications treats fully of railway, road, and river transport, and ports. It comes with something of a shock to those who knew only pre-Revolution Manchuria, to read of motor-bus services on the inland trails and motor scooters on the Yalu. The pages devoted to banditry and the features of it special to Manchuria are illuminating. Oddly enough, the author makes no mention of the term "hung hu tzu" (red-beard) by which brigands were commonly known. It was a very familiar word to the present writer when travelling in remote regions of the Fengtien and Kirin provinces, in the first decade of the century.

The author's tolerant attitude towards the opium question will commend itself to many readers; and his references to Soviet Russia show marked restraint and occasional admiration. He has even a good word for the Manchurian brigand, and his attitude to Chinese nationalism is markedly sympathetic. The chapters dealing with Mongol and Manchu "Banners" and "Bannermen" (Ch'i jen) are instructive reading.

This book was written before the proclamation of the independence of Manchukuo. Although the author, in one passage, hints at the possibility of Japanese pressure on China, through Manchuria, and, elsewhere, suggests a possible northward extension of the Korean border to the "Long White Mountain," he nowhere so much as adumbrates actual secession of Manchuria from China. This startling event profoundly alters the whole situation. The inevitable stranglehold that her possession of the South Manchuria Railway and the ice-free port of Dairen gave Japan, together with the treaty rights previously possessed by Russia, which passed (by treaty) to Japan, are perhaps insufficiently appreciated.

Certain minor defects in this instructive book may perhaps be touched on. Exuberant diction and the use of strange and unfamiliar words such as historicity, pejorative, megalopolitan, mores (for customs) act as checks to easy comprehension. The Khingan Mountains are so spelt in three of the four maps, but Hsingan in the text. The maps (railway, orographical, tribal, and "location") are adequate but might perhaps have been combined in one. M. E. W.

THE LAKHERS. By N. E. PARRY. With an introduction and supplementary notes by J. H. HUTTON. Published by direction of the Government of Assam. *London: Macmillan & Co.* 1932. 9 × 5½ *inches;* xx + 640 *pages; illustrations and map.* 36*s*

This very careful and thorough book was originally written "in order to facilitate an equitable decision of such disputes as the chiefs may be unable to settle," and as such has a special merit in showing how essential a study of comparative ethnology is to those who hold positions of importance amongst primitive tribes. It is obviously the result of painstaking study and a real knowledge of the district and its inhabitants, combined with a sympathetic interest in ethnographical conditions. In parts there is so much detail that the general reader might be overwhelmed, but the delightful chapters on folklore and on law and customs would recommend the book entirely on their own merits to the most casual reader. For a student of ethnology this book is particularly interesting, especially in showing points of contact with other nations and tribes, while the illustrations and pedigree plans are very helpful. C.

AFRICA

PEOPLE OF THE BOOK. By Major A. J. POTT. *Edinburgh and London: Wm. Blackwood & Sons* 1932. 7 × 4 *inches;* xxiv + 262 *pages; illustrations and sketch-maps.* 5*s*

Sir Reginald Wingate has written a comprehensive foreword to this collection of ten sketches of service in the Sudan, most of which have appeared previously in *Blackwood's Magazine* or the *National Review* and are reprinted here in book form. The author, the late Major Pott, after soldiering in South Africa, India, Burma, and West Africa, was seconded to the Egyptian Army from 1914 to 1921, and during that period saw active service on punitive patrols in most parts of the Sudan. The most important of these was the Darfur expedition of 1916, and we are given an interesting account and detailed plans of the battle of Beringia,

the decisive engagement of an important though little-known "sideshow" of the Great War. There is a good account of the difficult fighting in the Nuba Mountains and some other entertaining tales, rather marred by a somewhat melodramatic style and a too frequent and not always accurate use of the vernacular.

W. B. K. S.

WANDERINGS IN WILD AFRICA. By C. T. STONEHAM. *London: Hutchinson & Co.* 1932. 9×5½ *inches;* 286 *pages; illustrations.* 10*s* 6*d*

This book of travel by a practised novelist makes very interesting and vivid reading. The scenes and incidents are described with a literary skill that is quite unusual in this class of work and which adds greatly to its delight and value. The author takes us into the wilds of Kenya and gives us a clear and truthful impression of the experiences that every traveller is likely to meet with. We are told of the pains and pleasures of safari, the incidents of camp life, the changing aspects of the varied scenery. For sportsmen there are accounts of hunting adventures, many practical hints on equipment, and instructions on how to equip a safari when not possessed of the resources of the millionaire. For the naturalist there are glimpses of the habits of the wild game, with notes on the behaviour of the birds and reptiles and other less conspicuous creatures. Special attention is given to the habits of some of the larger species, particularly the elephant, buffalo, and bongo. A graphic account of the ascent of Mount Kenya is the part that will probably most appeal to the geographer. The book is full of information and variety, all made particularly pleasing by an easy style.

R. W. G. H.

LES PIONNIERS DU SOUDAN: avant, avec et après Archinard, 1879–1894. By JACQUES MÉNIAUD. *Paris: Société des Publications Modernes* 1931. 9½×7 *inches.* Tome I, x+574 *pages.* Tome II, 546 *pages; illustrations and maps* (*by* G. BRUYER). 200 *fr.* (*two volumes*)

These volumes deal essentially with the progress of French power in the Sudan between 1789 and 1894. As long ago as 1855 Faidherbe, Governor of Senegal, contemplated an advance to the Niger and built a fort at Medina. When he returned to Senegal in 1863 he sent Mage and Quintin "pour explorer la ligne qui joint nos établissements du Haut-Senegal avec le Haut-Niger," largely with a view to diverting the commerce of the Niger basin to Senegal. Faidherbe was however in advance of his time and his schemes came to nothing. They were revived in 1879 by the publication of M. Duponchel's brochure 'Communications entre nos possessions africaines et le Soudan.' A commission investigated the views therein expressed and recommended, *inter alia*, the construction of a trans-Saharan railway and a railway from the Senegal to the Niger. In the following year the "Compagnie Auxiliaire d'Ouvriers d'Artillerie de la Marine et des Colonies" was established and Borgnis-Desbordes was appointed Commandant Supérieur. From this point M. Méniaud, who is well qualified for the task, carries on the story in detail.

Under Borgnis-Desbordes the French firmly established themselves on the upper Niger and began the railway from Kayes to Bafoulabé. The work was continued by his successors, Boilève, Combes, Frey, and Gallieni. When the last named left the Sudan he was succeeded by Archinard, the central figure of these volumes, who was Commandant Supérieur from 1888 to 1891, and again in 1892–93, when for the first time that officer was independent of the Governor of Senegal.

Between 1888 and 1891 French territory was increased from 20 million hectares to 33 million, excluding certain protectorates. But important as was Archinard's military success it was probably surpassed by his work of administrative and

financial organization. The railway was put in working order as far as Bafoulabé, beyond which a Decauville track was laid; posts were established throughout the region; commercial activities were increased; the slave trade was attacked "dans son principe même, qui est la guerre des Noirs contre Noirs," as Archinard wrote; and specially selected officers were appointed to administer the country.

Archinard's work in the Sudan takes up so much of these volumes that little space remains for those who came after. His immediate successor, Bonnier, only held office for a year and was followed, in 1894, by Grodet, the first Civil Governor. With that important change M. Méniaud closes his history of French Sudan: the last few pages deal with the subsequent career of Archinard.

The author has drawn freely from the private correspondence and official reports of the Governors and has produced far more than a mere chronicle. He points out how geographical factors played their part in the story: the organization of the "voitures Lefebvre" in 1884, and the effect of the régime of the Niger on the progress of the river gunboats may be mentioned as two illustrations of this aspect. Equally interesting and important are the pictures of the men themselves. M. Méniaud has drawn his characters with a skilful hand and has produced a work of great value. One can only wish that he had done a little more to help his readers by the provision of an index. J. N. L. B.

CENTRAL AND SOUTH AMERICA

AMERICA HISPANA: a portrait and a prospect. By WALDO FRANK. *London: Charles Scribner's Sons* 1932. 9½×6 *inches;* xviii+388 *pages; map.* 16*s*

Mr. Waldo Frank has written a fascinating study of Central and South America. Though he avoids statistics his work is crammed with the results of research and observation, and it seems safe to say that no student of America Hispana will be wise to neglect it. The book is divided into two parts, a Portrait and a Prospect. In the former the characteristics of each part of the country are carefully described, and the history of its people traced to their origin. The chapters are headed the Andes, the Pampa, the Pacific, the Forest, the Central Sea, and it needs little imagination to realize how admirable is this division for the purposes of the book. Indian, Inca, Conquistador, Mestizo, Gaucho, Maya, Aztec, Spaniard, Negro, and the other races that have gone to make up the present population have their place in its pages, and their influence on the people of to-day is given due consideration.

Between the two parts is an Interlude on "San Martin and Bolivar," the two great liberators of the modern republics. A pregnant concluding sentence sums up the political situation with its application for the present age: "Peru and Bolivia depose their life-presidents, elected under Bolivar's plan, and march against each other. Quito becomes Ecuador. Sucre is murdered. Bolivar, reviled and dying, flees from Bogota. The chaos has begun. . . ."

The second part of the volume contains Mr. Frank's views for the future of the country. He has hard words to say about his own land, the United States, but is kinder to the South. "The problem in the United States is to free its impulse towards a fresh creative beginning: in America Hispana it is to find the means to fulfillment." Wisely he does not suggest many remedies, though he hints that a federation of certain of the republics might be a good thing.

Though every one will not care for some of the author's outspoken comments, and some may find his elaborate style rather wearisome, there can be little doubt that he has written a remarkable book, and has painted a fine and accurate portrait of South America. A. W. S.

TIERE IN BRASILIEN: eine biologisch-anatomische Forschungsreise nach Nordbrasilien und an den Amazonas. By HANS BÖKER. *Stuttgart: Strecker und Schröder* 1932. 10×6½ *inches;* x+308 *pages; illustrations and sketch-maps. M.*22 (*Bound M.*25)

Dr. Hans Böker is the Professor of Comparative Anatomy in the University of Freiburg-im-Breisgau and the successor of the well-known Professor Wiedersheim, the great authority on the anatomy of Vertebrates at the end of the last century. Dr. Böker's interests are perhaps slightly different from those of Wiedersheim, who was a follower of Gegenbauer and whose theme was the tracing of homologous structures and their evolution from the lower to the more highly organized creatures. Dr. Böker, on the other hand, is more interested in what he terms biological typology and his studies have been more in the direction of an analysis of the ways in which the movements and other activities of animal life are carried out. For this purpose he was very desirous of studying the animal life of the tropics on the spot, and he chose northern Brazil, where within comparatively easy reach of each other, very different types of country could be reached. These are the dry steppe country or Sertão of the State of Ceara, the rain forest of the Amazon basin, the savanna with gallery forest in the Island of Marajo, and finally the mangrove swamps of the coast. In July 1928 he set out for Belem or Para, accompanied by Dr. Panzer, who undertook the preservation and packing of the material collected; and from this centre was easily able to reach the different localities where he wished to make his investigations.

The volume before us contains an account of his observations and adventures written in a simple language and a popular manner and would be well worth translating into English. It is fully illustrated with photographs of scenery and of many of the animals met with, and the whole forms an attractive volume. The more serious results of the expedition are being published as separate memoirs in various scientific periodicals, chiefly in the *Morphologisches Jahrbuch.*

W. L. S.

GREATER AMERICA: an interpretation of Latin America in relation to Anglo-Saxon America. By WALLACE THOMPSON. *New York: E. P. Dutton & Co.* 1932. 9×6 *inches;* 276 *pages.* $3.00

The object of this book, the author tells us, "is the realization that Latin America is definitely the field where our money as well as our energies and our machines must serve in the building of an incubator of new wealth and new markets for the saving and the upbuilding of civilization." In writing thus he has the United States in mind, and for his purpose he has produced an informative and interesting handbook. He is quite right to call it "the last treasure house," but we on this side of the Atlantic may well question whether it is Saxon America alone, as he seems almost to imply, that will be responsible for the future greatness of Latin America. The fact that as much British as United States capital is invested in the different states supplies the answer to this. Rather it seems that Latin America is developing a life and cultus of its own. Apart from these considerations there is much to interest the ordinary reader. There are valuable chapters on the areas to be reclaimed and on communications, classified under the heads of rivers, ports, railways, highways, aviation, radio, and cables. The remainder of the book is rather of economic interest and contains useful statistics. There is a lengthy and comprehensive bibliography of literature on South America at the end.

A. W. S.

AUSTRALASIA AND PACIFIC

THE CALL OF THE BUSH: wanderings of a nature man on the Murray River. By HAROLD PRIEST. *London: T. Werner Laurie* 1932. 9×5½ *inches; 240 pages; illustrations.* 12*s* 6*d*

In this book Mr. Harold Priest tells of his aimless wanderings on the River Murray. If the subject-matter of the book were better one would say that it was spoiled by the author's annoying habit of inventing extraordinary words, no less than by his use of recognized words in unfamiliar and incorrect senses. The author was indeed fortunate to find an iguana on the banks of the Murray; however a man who found niggers in that district should be capable of finding anything.

The first thing that catches the eye about this book is the photograph on the cover, which is also reproduced in the text; it is of a man, presumably the author, clad only in a towel and a holster, hiding behind a gum tree and pointing a revolver at something which is not shown. Knowing the very strict laws which are in force in both Victoria and New South Wales concerning revolver licences I was interested to see what explanation would be given in the text of this illustration. There is no reference to it in the text, and the weapon is not mentioned in the author's list of equipment, so apparently it is another example of the old and reprehensible practice of putting a striking picture on the cover which is quite unconnected with the text.

The author states that in 500 miles the river falls 37 feet, or a distance of 8½ feet per mile; his mathematics would appear to be as weak as his geographical knowledge. No map is provided, but there is an amusing index, and some of the illustrations are quite good. R. R. R.

THE PIONEERING DAYS OF SOUTHERN MAORILAND. By M. A. RUGBY PRATT. *London: The Epworth Press* (*J. Alfred Sharp*) 1932. 7½×5 *inches; 232 pages; illustrations.* 6*s*

The greater part of this book is given to the account of four years' missionary work in 1840–44 among the Maoris of Otago Province, New Zealand, undertaken by a member of the Wesleyan body. In the course of the story a graphic picture is given of the ways of the wild men of European race who visited these shores as whalers and traders before civilized authority was established, and of the savage ferocity with which the Maoris conducted their inter-tribal wars and raids ere the ruler and the missionary appeared from Great Britain. Civilization is a taming force, and the high lights fade out as the story proceeds: the most arresting chapter in the book is an early one which records the deeds of Te Rauparaha, a bloodthirsty and proud warrior in whom Homer might have delighted.

Mr. Pratt's book would have been of wider general interest if he had taken opportunities of giving more precise information about the character and customs of the Maoris among whom the pioneer missionary worked, and the economic conditions under which the first British settlements in Southern New Zealand were established. The geographical interest of the book is slight; there is no map of any kind, and the illustrations do little to help the reader, even if he has seen the locality, to get his bearings in the landscape as it appeared a century ago. E. W. S.

POLAR REGIONS

THE CALL OF THE NORTH. By H. H. HOUBEN. Translated by H. J. STENNING. *London: Elkin Mathews and Marrot* 1932. 8½×5½ *inches;* x+348 *pages; portraits.* 15*s*

Professor Houben has tried in 348 pages to tell the story of Arctic exploration from the time of Alexander the Great to the present day. The book is not a

précis of facts, nor is it merely a romantic story; but it is inclined to be a mixture of the two. Since so short a work is not concentrated on some single aspect of the subject which it might have dealt with thoroughly, it must be read as a stimulant to the imagination and not as a justly proportioned history. Professor Houben's style is vivid: what he has chosen he has described clearly and faithfully. But there is no natural connection between the chapters; in effect they are separate short stories.

Most of the better-known Arctic explorers are mentioned in chronological order. As a rule they are dealt with in only a few pages, and often a large proportion of this space is devoted to some incident like a bear hunt. Motive and method are hardly mentioned, and results are often confined to a description of the hardships endured. The second half of the book is better than the first. There is an interesting comparison between Peary and Cook in favour of the latter, and a good account of the various aerial expeditions to the North Pole. J. M. S.

CARTOGRAPHY

LE NIVELLEMENT GÉNÉRAL DE LA FRANCE de 1878 à 1927. (Ministère des Travaux Publics. Service du Nivellement Général de la France.) By CH. LALLEMAND and E. PRÉVOT. Exposé préliminaire. Procès-verbaux. Documents administratifs. Comptes-rendus des travaux du service. *Paris* 1927. 12×8 *inches;* xxxiv+664 *pages; illustrations and maps.* 200 *fr.* [250 *fr. with extra plates*]

This bulky volume contains the administrative history of that excellent undertaking, the General Levelling of France, with some interesting appendices of a more technical character. There is an Historical Summary of a couple of pages; but this "Aperçu Historique" is not free from error. Thus, we are told that, "Bourdaloué, Conducteur des Ponts et Chaussées, eut, le premier, il y a trois quarts de siècle (*i.e.* about 1850), le mérite de montrer qu'en raccourcissant à une centaine de mètres les visées, en obtient des résultats cent fois plus précis. Ce fut l'origine des nivellements de précision." This remark follows a statement that until the middle of the nineteenth century altitudes were derived from the triangulation. Elsewhere the statement is made that Bourdaloué completed his levelling of France between 1857 and 1864, and that this levelling "fut la première grande opération de ce genre exécutée dans le monde."

I feel sure that my friend M. Ch. Lallemand, to whom the science of levelling owes so much, will forgive me if I point out the following facts: Levelling with a Y Level was carried out, in Kent, by Mr. J. A. Lloyd in the year 1830, and in many respects this levelling was on modern lines, in particular, short rays were used, and on marshy soil Lloyd used a mirror for reading the bubble, "without moving my head from the eye end of the telescope." Then, in 1837–38, Mr. Bunt, under the general supervision of the celebrated Dr. Whewell, carried out a line of levelling from the Bristol Channel to the English Channel. In this levelling the important precautions were adopted of setting up the fore and aft staves at equal distances from the level, and of levelling completely in both directions.

But, more important still, with reference to the remark last quoted, the Primary Levelling of Great Britain was commenced in 1841 and was finished in 1860. The total length of the primary lines was about 10,000 miles, and all the lines were double levelled. The least-square adjustment was carried out by Colonel Clarke, and the results were published in 1861. So that it would appear to be impossible to accept the statement that Bourdaloué's level network of France was "la première grand opération de ce genre exécutée dans le monde." That distinction would seem to belong to the Ordnance Survey Primary Levelling of

Great Britain—at least, until some one can find the record of an earlier operation of similar magnitude.

However, apart from the question of priority, the work of Bourdaloue deserves great praise for having sufficed for the needs of France for many years. But the time, of course, came when it was no longer considered sufficiently exact or complete. So we find that in 1878 M. de Freycinet, then Minister of Public Works, formed a commission to consider the matter, and that this commission handed over the detailed study to a sub-commission, and, ultimately, a small committee was put in charge of the actual execution of the work. The new network was to have a total length of about 25,000 kilometres and to cost some 19 million francs. Financial difficulties prevented the commencement of the work until 1884, when a small beginning was made, under the direction of the Secretary of the Executive Committee formed for the purpose: it was most fortunate that this Secretary was M. Lallemand.

The new scheme was to comprise a network of the first order and a network of the second order. The fundamental, or first order network, for continental France, not including Corsica, measures 12,135 kilometres. The primary work includes 32 polygons, with a mean perimeter of 550 kilometres. The probable systematic error per kilometre was $\pm 0{\cdot}12$ mm., and the probable accidental error per kilometre, $\pm 0{\cdot}8$ mm.; these numbers may be compared with the errors of the Second Geodetic Levelling of England and Wales, as deduced by Mr. H. L. P. Jolly, namely, $\pm 0{\cdot}12$ and $\pm 0{\cdot}44$. The French first order network was carried out between 1884 and 1892, and the second order network between 1892 and 1898. Then there are networks of the third and fourth orders.

The Service du Nivellement Générale also carried out the necessary observations for the determination of mean sea-level at Marseilles and at twenty-three less important stations, some of these being established on the coasts of Tunis and Algeria. The fundamental station is at Marseilles, and, from observations taken for twelve years at this station, covering the years from 1885 to 1896, inclusive, the "zéro normal" was deduced, and this is 71 mm. below Bourdaloue's zero. It should be remarked that the old levelling, as compared with the new, showed differences of no less than 1 metre, accumulated in the distance between Marseilles and Brest.

Tables and diagrams show the very large amount of work executed in the third and fourth order networks; the total length of lines, of all orders, levelled up to the year 1927, was no less than 130,000 kilometres. There is a very interesting appendix which deals with the variations of mean sea-level at Marseilles, over a period of thirty-nine years. One of the editors, M. Prévot, appears to have proved the existence of four long-period tides, with periods of 93, 18·6, 11·1, and 8·85 years. The 18·6 period tide has an amplitude of about 3 centimetres. The longer period tide, found by using extra observations dating from 1851, seems to have an amplitude of about 3 centimetres also.

At the end of the book there is a valuable list of the writings of M. Ch. Lallemand on the subjects of levelling, mean sea-level, movements of the crust and allied subjects; there is also a similar list of the works of M. E. Prévot.

C. F. C.

ECONOMIC AND HISTORICAL GEOGRAPHY

A CALENDAR OF THE COURT MINUTES, ETC., OF THE EAST India Company, 1671–1673. By Ethel Bruce Sainsbury. *Oxford: Clarendon Press* 1932. 9×6 *inches;* xxviii+356 *pages.* 18*s*

This is the ninth volume of a series which, like the 'Factory Records,' edited by Sir William Foster, is of value to students concerned with the history of the

East India Company. The three-year period dealt with was not remarkable for any momentous incidents in India itself, but the renewal of war with Holland led to one memorable event, namely the capture by the Dutch on 1 January 1673 of the island of St. Helena, which had been a valuable asset of the East India Company since 1651. A week or two later a Company's fleet left the Downs convoyed by four warships under command of Captain Richard Munden, who recaptured the island on the voyage, receiving a knighthood for his services. A transcript of the relevant portion of this officer's somewhat laconic journal and of the official "relation" of the action will be found on pp. 315–319. In spite of the war however the Company's trading improved so far as to justify the resumption of payment of dividends, which had not been paid for five years.

Compilations of this nature being chiefly used for reference by research workers, their value largely depends upon competent editing, the selection of matter suitable for printing, and accurate indexing. Miss Sainsbury's qualifications have enabled her to perform her task in an efficient and scholarly manner. In his Introduction a careful and exhaustive summary of the affairs dealt with during the period has been recorded by Mr. Ottewill, the Superintendent of Records, India Office. C. E. A. W. O.

VASCO DE GAMA: ou l'épopée des Portugais aux Indes. By JEAN-PAUL ALAUX. *Paris: Duchartre* 1931. $11\frac{1}{2} \times 9$ *inches;* xxxii + 282 *pages; illustrations and facsimile maps* (*and water-colours by* GUSTAVE ALAUX)

After an introduction on the science of navigation and a sketch of the personality and work of Prince Henry the Navigator, John II, and Manuel I, the author describes in twenty-nine chapters of rather florid prose the voyages of the Portuguese to the East, their military exploits, relations with Abyssinia, the dispute with Spain over the Moluccas, the two sieges of Diu, the legend of St. Thomas, and the preaching of St. Francis Xavier, and gives some pages to an account of Indian religions and to the "enchantments of the tropical forest." His narrative is somewhat disconnected; he passes from D. John de Castro to D. Luis de Ataide, and ends with a picture of old Lisbon and of Cintra as he saw it, and appends a legendary biography of Camões and a list of the descendants of Vasco da Gama. We wonder where he learnt that the poet knew the 'Iliad' and 'Odyssey' by heart. There are fine but imaginary coloured drawings of the fleet of Da Gama leaving the Tagus and arriving at Calicut, of Albuquerque's naval battle at Ormuz, and of the vessel which brought Camões home passing the Tower of Belem.

Such value as the book may have for students lies in the forty beautiful reproductions of portraits and documents; but to the authentic likenesses of Henry the Navigator and Da Gama from the Museum of Ancient Art in Lisbon it was needless to add the fancy ones from Sir Richard Fanshawe's translation of 'The Lusiads.' The views of ships from the 'Livro das Armadas' in the Lisbon Academy of Sciences are welcome because the codex has never been printed; it was exhibited at the Jeu de Paume in Paris last summer, and Dr. José de Figueiredo, Director of the Museum just mentioned, wisely had it photographed. We are also glad to see pictures of the famous sixteenth-century Japanese screen at the Musée Guimet showing the arrival of a Portuguese ship and the landing of the passengers wearing balloon trousers, though the identification of the principal figures is disputed.

The plans of fortresses are of later date than the events described, because earlier ones are not available, but the view of Lisbon and its earthquake of 1755 seems out of place. At least in the domain of history, scholarship is rarely associated with luxury books like the present; its paper, type, and red tail- and

head-pieces are extremely attractive, but the text has few traces of the deep studies suggested by the publisher's circular. The author thinks that the Infant D. Pedro was Regent when Ceuta was taken, that Prince Henry founded Batalha, that Batholomew Dias, on the voyage in which he discovered the Cape, reached the Mozambique channel, and that Cabral left Lisbon for the East in 1502.

The map of Juan de la Cosa, a poor piece of draughtsmanship, is exalted, and the far better ones of Cantino and Canerio are ignored, and though ample justice is done to the Portuguese as explorers, the unproved French claims to a prior discovery of Guinea and the Gold Coast are insisted upon. Yet, notwithstanding its defects, the many who will approach history only by its romantic side may here learn some outstanding facts, and it is well that M. Alaux should have compiled it, if only because the French have paid small attention to the annals of Portugal, though the Portuguese have, intellectually, been their admiring pupils.

E. P.

THE LIFE OF THE ICELANDER JÓN ÓLAFSSON, Traveller to India. Translated from the Icelandic edition of SIGFÚS BLÖNDAL by Dame BERTHA PHILLPOTTS. Volume II. Edited by the late Sir RICHARD TEMPLE, BT., and LAVINIA MARY ANSTEY. *London: Hakluyt Society* 1932. 9×5½ *inches;* xxx+290 *pages; illustrations and plan*

Jón Ólafsson (1595–1679), though he refers to connection on his mother's side with ancestors of distinction, came of a peasant family of Iceland. His early manhood was spent in the service of the King of Denmark as a gunner's mate, and in this capacity he served at Copenhagen and on war vessels, making several voyages, including one to India. When settled down in Iceland, after retirement from active service, he appears to have devoted some attention to literary pursuits. His chief work was his autobiography, the first printed edition of which, carefully collated from the extant Icelandic MSS. by Dr. S. Blöndal, was published at Copenhagen in 1908–9. An admirable English translation of this was made for the Hakluyt Society by the late Dame Bertha Newall (then Phillpotts) for issue in their series in two volumes. Vol. I, which was published under her editorship in 1923, dealt with Ólafsson's early life, his voyage to England in 1615 and brief stay in this country, and, more particularly, with his experiences as a gunner's mate in Copenhagen and on the northern seas. The second volume, now published, begins with a hearsay account of the first Danish expedition to India (1618–21), but is mostly taken up with Ólafsson's personal experiences during the years 1622–26 on his voyages to and from India and his life at Tranquebar as a gunner in the Danish fortress of Dansborg. Here the autobiographical part ends, the concluding pages containing a very brief account, by another hand, of his life after retirement to Iceland in 1626.

Composed in his old age (in 1661) and, as the evidence shows, from memory only, it is not surprising that several inaccuracies should be noticed in the autobiography: the wonder is that there are so few. The narrative indeed testifies to a very retentive memory and habits of close observation. Its chief value lies in its presentation of events from the point of view of a gunner in the ranks and of the lower deck, that is, of a class whose views have so seldom found expression. While little of special value or importance has been recorded, the remarkably vivid character sketches of King Christian IV call for attention, and the story of seventeenth-century life in Tranquebar and its vicinity is interesting from its references to contemporary Indian customs and the information given about the Danes in their settlement, some of which is not available elsewhere. For geographical details use was made of Nansen's 'Compendium Geographiae.' Of a simple and sincere nature himself, Jón at times gives way to exaggeration as well

as credulity. Still the tale of his experiences and adventures by sea and land is well worth reading.

The editing of the second volume, which had been entrusted to the late Sir Richard Temple, was delayed by his ill-health and death, but it has been completed in a very efficient manner by Miss L. M. Anstey, who has prefixed a useful introduction and added a carefully compiled index. C. E. A. W. O.

THE STORY OF THE ROAD: from the beginning down to A.D. 1931. By J. W. GREGORY. *London: Alexander Maclehose & Co.* 1931. 9×5½ *inches;* xii+312 *pages; illustrations.* 12*s* 6*d*

It is a remarkable and interesting journey which starts among the hunters' tracks in the African forests and which ends on the arterial roads of Great Britain. As a guide the late Professor Gregory has combined a scientific knowledge with an appreciation of the romantic character of the great highways. The book is in two parts, the first of which describes the ancient and mediaeval roads, and the second the evolution of the modern road. At times the author digresses to describe roads which he has traversed in far-distant parts of the world. This has made the treatment of the subject very general, but has given the book a wider interest.

Apart from the hunters' paths, the earliest European highways were those formed by the amber traffickers down the valleys of the Elbe and the Inn, or the green roads on the English downs along which the tin was carried to the coast. The Romans established a system of well-built roads, whose remains, patched here and there, were the chief highways of Europe until the eighteenth century. From the fall of the Empire until the time of Trésaguet, Telford, and Macadam the principles of highway construction were practically unknown. Professor Gregory, like Jusserand, compares the roads of western China to those of the Middle Ages. One road in Chinese Tibet he describes as "a deliberately planned obstacle race." He follows Thorold Rogers in considering that the bad state of the mediaeval highways has been much exaggerated, but does not quote or refer to any authority. In the reign of Henry III Bracton quoted "elders as saying that a reasonable day's journey consisted of twenty miles." A recent author has said that a normal day's journey in the fifteenth century was from 30 to 40 miles.

The increase of wheeled traffic in the sixteenth and seventeenth centuries subjected the highways to harder use. The statute labour was ill-enforced and the condition of the highways went far to justify the opinion that the Pilgrim's Progress was written to show the bad state of the roads in England. The Turnpike Trusts proved only a partial solution of the problem; and it was not until skilled engineers were employed that the roads were adapted to the traffic. In the course of eighteen years' work—not including the famous Holyhead road—Telford built 920 miles of new road and 1117 new bridges. Realizing the injurious effect of the Scottish climate on the surface of the highways he laid great importance on good drainage and constant inspection. Professor Gregory emphasizes the social aspect of his work and his attempt to check the tide of emigration from the Highlands. Macadam as a scientific road constructor ranks higher than Telford. He was the first to appreciate how the surface tension of water knits together a road of broken stone. The most valuable chapters of the book discuss various road materials and the principles of construction since the time of Macadam. The motor has necessitated wider roads and fewer sharp curves. It has been necessary to modify the macadamized road on account of the dust and because the rubber tyre detaches by suction flat stones from the road. The motor road must have a smooth and coherent carpet. This is secured in America

by concrete and in Great Britain by tarmacadam sealed with tar or calcareous cement.

The book ends on a gloomy note. In the extension of the great highways Professor Gregory sees the extinction of the countryside. His only comfort lies in the fact that these roads may cost anything up to £100,000 a mile. Constructive thought alone can save the country. The roads can be adapted to their surroundings by planting trees and leaving a grass strip on either side. It is not so much the roads which are the menace as the monstrosities which appear in their wake. As the local authorities are notoriously apathetic, a central authority with extensive powers should restrain the unlicensed growth of petrol pumps and should cure the country of its rash of advertisements. T. D. T.

GENERAL

NELSON'S WORLD GAZETTEER AND GEOGRAPHICAL DICTIONARY with Map Supplement by BARTHOLOMEW. General Editor, J. GUNN, D.SC. *London: Thomas Nelson and Sons, Ltd.* [1932]. 6×4 *inches;* 575 *pages*+64 *pages of maps.* 3*s* 6*d*

This gazetteer was issued about eighteen months ago—why undated?—without the map supplement at 2*s*. 6*d*. The maps, mostly covering a double page each, are a useful addition to a volume that is wonderfully good value for the money. We are told that there are over 10,000 separate entries with a guide to the pronunciation of every name, and also that the published lists of the R.G.S. (*i.e.* of the P.C.G.N.) have been taken as a guide for spelling though not in the case of special characters (*i.e.* Latin letters with diacritical marks) such as those adopted in certain countries of Central and Eastern Europe. The policy of simply omitting the diacritical marks may please the printers and unintelligent readers, but it is of very doubtful advantage otherwise. These marks have just as much effect as the French accents and cedilla and the German vowel-modifications, which are not ignored here; it is absurd for the western nations to shut their eyes to them. Although the pronunciations of individual names appear to be correctly given in most cases, they give a misleading idea of the sounds of some foreign letters; it might easily be inferred, for instance, that Czech *c* was pronounced as *ch*, Polish *o* as *oo*, and Romanian *t* as *ts*. The book was probably printed too soon for the new Turkish spellings to be adopted. In one or two instances the system of expressing pronunciation is unfortunate: *e.g.* the use of *ä* for the vowel in *psalm* while *ā* shows that in *mate*, and *ö* for the vowel in *lord*, though that in *call* is given by *au* or *aw*. There is no provision for the sound of French *u* (German *ü*): *e.g.* Mulhouse is said to be pronounced Moolooz. By the way, the pronunciation of Reykjavík should be, according to this system, Rākyävēk, not Rīkyävik, a common and persistent mistake.

The Dictionary of Geographical Terms contains ethnographical groups like Aztecs and Basutos and even commercial products like arrowroot and bananas, in addition to entries of the usual type. Among these the form "hinderland" is an unnecessary substitute for the well-established "hinterland" which finds a place in the O.E.D., where "hinderland" is given two meanings; the first is a kind of cloth imported from some inland country, perhaps from inland Germany, while the second is best illustrated by the quotation from Stevenson and Osbourne's 'Wrecker': "'Set down upon your hinderlands,' cried my grandfather almost savagely." J. H. R.

BRITISH ARCTIC AIR ROUTE EXPEDITION: ASTRONOMICAL OBSERVATIONS

The following are the final results of the observations for latitude and longitude taken during the British Arctic Air Route Expedition of 1930–31. They are given to the nearest 5 seconds of arc; 3¼-inch theodolites, reading by micrometer to 10 seconds, were used. The latitudes are from circummeridian altitudes of sun and north and south stars; and the longitudes from sun and east and west stars for Local Mean Time, with the Greenwich Mean Time from Wireless time signals.

Observations were taken at several other places, but only the most reliable, and those of which the positions are included on the maps published in the *Geographical Journal*, are given in the list.

At several places observations were also taken for Magnetic Variation, and the results of these are given at the end of the list.

Latitude and Longitude

Station No.	*Description of Locality*	*Latitude*	*Longitude*
2	Lake Fjord. Small promontory north side of fjord, ¼ mile from head	66° 20′ 35″	34° 59′ 10″
4	Ailsa Island. South-west extremity of small unnamed island at mouth of Lake Fjord ..	66 17 15	—
5	Wahls Fjord. Rocky headland at mouth of fjord on north-east side	—	34 41 20
6	Kangerdlugsuak Fjord. Head of fjord south-west side of main glacier: on small rocky point ..	68 29 40	32 36 55
10	Kangerdlugsuak Fjord. Point dividing main fjord from Amdrups Fjord to west: 150 yards from end of point	68 11 55	32 10 25
15	Long Island. Near east end of island in bay on south side 300 yards west of glacier ..	67 03 45	33 30 45
23	Angmagssalik. Close to church at main settlement of Tasiusak	65 36 45	37 38 15
24	Base Camp. Small promontory near head of Kangerdlua Fjord on east side	65 38 50	38 38 25
31	Kajartalik Island. Small bay on north side of island	65 13 20	39 34 50
32	Pikiutdliuta Island. Camp near point north-west side of island	64 58 05	40 20 15
33	Umivik Fjord. Eskimo winter house	64 20 15	40 41 20

Magnetic Variation

Station No.	*Description of Locality*	*Date*	*Magnetic Variation*
5	Wahls Fjord. As above	18 8 30	35° 04′ W.
6	Kangerdlugsuak Fjord. As above	24 8 30	44 31
7	Kangerdlugsuak Fjord About 24 miles south of Station 6	26 8 30	39 50
13	Cape Christiansen. Approximately 67° 22′ N., 33° 20′ W.	5 9 30	37 13
24	Base Camp. As above	5 10 30	43 09
32	Pikiutdliuta Island. As above	28 8 31	43 12

GRAVITY MEASUREMENTS IN ITALIAN WATERS

The great possibilities offered by the methods inaugurated by Dr. Vening Meinesz for the determination of gravity beneath the oceans have aroused much interest in Italy, and a good beginning was made last year with such determination beneath the Italian waters from a submarine of the Italian Navy, the *Vetta Pisani*. The undertaking was promoted by General Vacchelli and other Italian geodesists, and the observations were entrusted to Signor Gino Cassinis, who has kindly sent us the reprint of a summary account of the cruises published in the *Bolletino* of the Italian Geodetic Committee for January 1932. Unable to accept an invitation to carry out the work himself, Dr. Meinesz gave it his cordial support, and not only obtained for it the loan of the apparatus used in his own submarine campaigns, but undertook its conveyance to Genoa, where he gave full instructions for its use. It was decided in the first instance to cover as wide a field as possible and to leave for later occasions the intensive study of special areas characterized by seismic or volcanic phenomena. The cruises covered all the waters to the west and south of the peninsula (the Adriatic being omitted simply for want of time), and altogether about one hundred stations were occupied, eighty-eight of them in the open sea. During the greater part of the time satisfactory determinations of depth were made by echo-sounding. In conjunction with determinations already made on land, the new work will greatly help to a knowledge of gravity anomalies in an extensive and specially interesting part of the Earth's surface.

CHANGES IN THE MIDDLE COURSE OF THE PO

Few if any of the major rivers of Europe have been subject to such violent changes as the Po, not only in the region of the delta, where such changes are to be expected, but in its whole central course from Piacenza downwards. An elaborate attempt to define such changes in prehistoric and historic times is made by Signor F. de Chauraud in the first number of *L'Universo* for 1932. He allows that the subject is one of great difficulty, at least as regards the earlier epochs, and he has to depend, not only on more or less general geological considerations, but on the distribution of the early inhabitants, beginning with the Proto-Kelts as deducible from the impress they have left on the modern population, holding that such distribution must have been largely influenced by the barrier to movement set by the river. Geologically, the evidence goes to show that in early, post-pliocene times, when the detritus brought down from the Alps far exceeded that from the lower and less glaciated Apennines, the tendency was for the central depression to be pushed south towards the latter range, and he finds this confirmed by anthropological evidence. He draws the course of the Po at the close of the neolithic along a line running south-east from Piacenza, roughly following the course of the Emilian Way at the northern edge of the ice-age deposits. Only in the latter centuries B.C. did it make a decided northward deviation to the neighbourhood of Cremona, below which it still kept far to the south of its later course. Within later historical times the changes are worked out in greater detail, partly on the evidence supplied by actual records. Some of the difficulties raised by the narratives of battles in Roman times can, the writer holds, be got over on the supposition of changes in the river course without treating the historians as untrustworthy. After the beginning of our era the general course below Cremona coincided with the present, though still with a gradual northward shifting, down to about Guastalla, below which it continued roughly eastward, instead of, as now, making a sharp northward bend, initiated about 1400. Before this however there had been a more gradual displacement northward—the general direction of movement in post-glacial

times. An attempt is also made to define the changes in the courses of the main northern tributaries, also very extensive. Both the Oglio and Chiesa are held to have maintained a nearly southward course after their exit from the mountains down to the last centuries B.C., after which both have shifted their lower courses to the south-east. These violent changes die out as we approach the meridian of Ferrara, on which the earliest course is laid down as no great distance south of the present one. The article is illustrated by three maps showing the geological and anthropometric data, and the supposed courses of the main river and its tributaries at various epochs.

RUSSIAN EXPLORATION OF THE NORTHERN URAL

For some years past, systematic exploration of the northern part of the Ural range has been carried out under the auspices of the Russian Academy of Sciences, and has yielded some interesting results. The work done in 1928, the fifth season in which it had been in progress, has lately been described by the leader of the expedition, the geologist A. N. Aleshkov, in the *Izvestia* of the Russian Geographical Society, 1931, part 4, with a summary in English. The part of the range examined, between lat. 63° 10′ and 64° 10′ N., consists of a series of chains and depressions, and its present aspect is a result of glacial action (glaciers still existing at the present day), which is to be seen in the cirques, troughs, and terraces which characterize it. Botanically, four different types of vegetation can be defined, varying from sphagnum swamps through meadow-woodland to compact woods of fir. The bird life showed a sharp contrast with that farther south, and the north and Polar Ural may be considered a separate zoological region, with some elements of the fauna of Eastern Siberia.

NORTH LAND IN THE SIBERIAN ARCTIC

In the *Journal* for July 1931 (p. 91) some account was given of the Arctic voyage in 1930 of the Russian ice-breaker *Sedov*, during which an examination was made of the waters west of North Land (Severnaya Zemlya), as the land discovered in 1913 by Vilkitski north of Cape Chelyuskin is now named. A station was then established on the Kamenev group of islands and a party left in charge of it. From an account of recent Russian work in that region given by A. Külerich in the *Geografisk Tidsskrift* for March 1932 we learn that this party has since carried out for the first time a careful exploration of North Land, about 70 per cent. of the surface being examined by means of sledge journeys in the summer of 1931. It consists of three large islands, which have received the not very attractive names (from south to north) of Bolshevik, October Revolution, and Komsomolets; while the straits between are named respectively Shokalski Sound (after the well-known Russian geographer and oceanographer) and Red Army Sound. The geological work shows that North Land is an ancient folded area of most intricate structure, probably of Archaean age. During the quaternary epoch it subsided, but a more recent uplift supervened, causing several fractures. Most of the land is covered with inland ice from which glaciers descend to the coast, producing however few icebergs. The interior consists of two plateaus at heights of 400 and 600 metres, while a wide foreland occupies the southern part of the west coast. Unlike Vilkitski Sound, the channel between North Land and the continent, Shokalski Sound appears to be open every summer, and if so is likely to prove valuable in connection with navigation along the Arctic coast of Asia.

RECENT GERMAN STUDIES OF THE INDUS AND EASTERN SIBERIA

The first number of the new publication, *Dresdner Geographische Studien*, is a geographical study of the Indus by Fr. Anne M. Prölst. This largely consists of extracts from, and references to, existing literature, with an extensive bibliography. The writer discusses, among other topics, the influence of the ice-age on the upper Indus valley, and its formation, and the irrigation system of the lower course, which is the most important function of the river. In a long discussion on the source of the Indus in the Rhakas–Mansarowar area she does not refer to the visit of Mr. Hugh Ruttledge and Colonel R. C. Wilson (*G.J.*, vol. 71, 1928, pp. 431–440). On that visit it was found that though the season was favourable, the channel between Rhakas and Mansarowar was dry, though according to local tradition it was usually flowing in summer; the bed of the Sutlej above Lajindak was also dry. The writer also appears to be unaware of Sir Aurel Stein's identification of the site of Aornos.

We have also received a further number of the *Veröffentlichungen* (N.F., No. 5) of the Geographical Institute of the Albertus University, Königsberg. In this Professor A. Schultz gives a systematic account, partly based upon a recent visit, of the Usuri region of Eastern Siberia. Though politically part of Eastern Siberia it is climatically in "monsoon Asia." The area lying to the north of Vladivostok is separated from Mongolia by the Usuri river, a tributary of the Amur. The structural feature is the "fault-block" Sikhota Alin range. Though apparently capable of development—there are minerals, particularly coal, and rice and soya beans do well in the south—the area at present seems in a chaotic condition. The great majority of the three-quarters of a million inhabitants are Russian immigrants, but there are 100,000 Koreans who have moved north since the Japanese annexation of Korea. These, being agriculturalists and accompanied by their families, are an undoubted asset—much more than the 38,000 Chinese immigrants who have come in, without their women folk, to exploit the natural resources. The Mongoloid aborigines now number about 7000, and are decreasing.

ZEBAYIR ISLANDS, RED SEA

This group of volcanic islands, about which, owing to difficulty of access, little precise information exists, were visited early in 1927 by Dr. W. A. Macfadyen, who records the results of his examination in the *Geological Magazine* for February 1932. The group consists of ten islands, with associated rocks and shoals, extending over 25 km. from north-north-west to south-south-east just north of lat. 15° N., and rising steeply from an irregular marine bank, elongated in the Red Sea trend, which itself rises from the deepest part of the Red Sea trough in this latitude. The largest island, Jebel Zebayir, is 6 km. long, with a maximum elevation at the south end of 224 m. Pushing inland from the north-west corner over very rough ground consisting of black vesicular basalt, the writer climbed the main volcanic cone, 162 m., which is composed mainly of scoriae. It has a perfect crater rim, knife-edged, and sloping equally steeply inwards and outwards. Its crest gave a fine view over the whole group, and thirteen volcanic cones and vents were counted, seven being on the main island, all of the same explosive type: no doubt others exist. Dr. Macfadyen puts the date of formation of the group as later than most of the volcanics of the Aden region, which are well dissected by erosion and show raised beaches, while none were seen on Zebayir. Even if now extinct, the perfect cones in the south of the group point to activity at a relatively recent date.

GLACIATION IN EAST AFRICA

Mr. Erik Nilsson, a member of the Swedish Geological Expedition to East Africa in 1927–28, began an investigation of ancient glacial moraines and lake deposits and contributes an account of this to the *Geografiska Annaler* (Årg XIII, 1931, Häft 4), under the title "Quaternary Glaciations and Pluvial Lakes in East Africa." He made a special study of Mount Elgon, which he indicates was formerly glaciated over an area of 75 sq. km., but shows also that Mounts Kenya, Kilimanjaro, and Ruwenzori bear distinct traces of an ancient glaciation at least three times as extensive as that now prevailing.

The chief points in a somewhat lengthy but beautifully illustrated article are, first, that comparative study of the moraines on all the mountains in question leaves no doubt that the recession of the ice proceeded simultaneously so that the maximum glaciation was contemporaneous on all the mountains of East Africa; secondly, that in neighbouring low-lying areas between these mountains, such as the Nakuru–Naivasha and Baringo–Hannington Basins in the Eastern Rift Valley, there is abundant evidence of a former pluvial epoch in the river-beds and lake basins now wholly or partly dried up; third, that correlative study of the mountain moraines and the valley beaches and sediments renders it highly probable that the glaciers and lakes varied together and that a cold wet pluvial epoch in East Africa prevailed at the time of the Ice Age in Europe. The author then passes on to discuss evidence for corresponding sequences of climatic change in East Africa and Egypt, and concludes that the ancient lakes of the Faiyum Depression belonged to the same epoch as those of East Africa. He finally suggests that if his results are substantiated an important step will have been made in the world-wide correlation of events in the Pleistocene Ice Age, which there is strong reason to think was contemporaneous over the whole Earth.

CHICHON, A MEXICAN VOLCANO

While on a geological expedition in the north of the State of Chiapas in 1928, F. K. G. Müllerried discovered an active volcano, previously unrecorded. An alleged outbreak the following year led to the organization by the National University of Mexico of a research party in 1930. An account of the volcano, with photographs and sketch-maps, is given by Herr Müllerried in the *Zeitschrift für Vulkanologie*, vol. 14, 1932, pp. 191–209.

The volcano, Chichon, is approximately 23 km. south-south-west of Pichucalco, and 130 km. from the Gulf of Mexico. The area is covered with forest, and thinly peopled. The highest point of the volcano is 1315 metres. The chief sign of activity discovered were ten solfatara, the smoke from which rising within the crater make it appear volcanically active. On the outer slopes there were four hot springs, and earth tremors were felt in the neighbourhood. It is a portion of a sedimentary zone which extends for about 300 km. from San Cristobal Las Casas to Vera Cruz. Its relation to the Mexican system, which is divided from the Central American by an ancient crystalline zone, has not yet been established.

GULF STREAM TEMPERATURES

The *Geographical Review* for April 1932 contains a study by Mr. P. E. Church, of Clark University, entitled "Surface Temperatures of the Gulf Stream and its Bordering Waters." The investigation, made under the direction of the Woods Hole Oceanographic Institution, uses a number of thermograms supplied from steamers operating the Atlantic north of lat. 30° and west of long. 62° between 1929 and 1931. The boundaries of the Gulf Stream are clearly defined both on

the north and south sides, but especially the former, where a very abrupt change in the sea temperature, particularly in winter, occurs at the "cold wall." This marked temperature contrast seems to favour eddying in the colder months of the year along the northern edge, causing large temporary projections of Gulf Stream water to enter the cooler water to the north. Occasionally the offshoots may be fed by the Gulf Stream for several weeks, suggesting that the latter has taken up a more northerly position. Wanderings of this character are greatest in the part of the Stream which flows south of Halifax. Here the northern edge is on an average about 290 miles distant from the coast, though it has been within 230 miles and as far away as 420 miles. But it is pointed out that the width of the Gulf Stream remains quite constant, and that the northern edge has been farther south than the mean position of the southern edge, and the southern edge farther north than the mean position of the northern edge.

The thermal distribution of the Gulf Stream is unsymmetrical in that the highest temperature occurs nearer the "cold wall" than the southern edge. Off Cape Hatteras the annual range of temperature along the thermal axis is about 11°, from 74° to 85° F.; south of Nova Scotia about 14°, from 69° to 83° F. To the south the Gulf Stream is bordered by a wide expanse of slightly less warm water in which the distribution of temperature is very homogeneous. Here the mean annual range is about 17° (65° to 82°). It is considered that the surface temperatures of this broad expanse exert a greater influence on the climate of the eastern seaboard of America than do the surface temperatures of the narrow Gulf Stream, but that, on account of correspondence in the departures from normal, the Gulf Stream temperatures may be used as an index of the temperatures of the wide warm area.

MEDIAEVAL SEA-STATES

In a paper contributed to the *Scottish Geographical Magazine*, May 1932, Mr. H. C. Darby examines the geographical elements in the growth of the mediaeval sea-state. The doctrine of the "mare clausum" was the expression of the contemporary trend of development, and the enclosed sea attained to cultural and historical unity. Attempts to evolve a political unit from these affinities, in the more successful examples, expressed themselves in the occupation of strategic sites and the control of trade routes, and often associations of merchants for mutual protection. Their great advantage over land powers lay in the rapidity of sea passages as compared with land journeys: the slowness of the latter imposed decentralization upon land rulers. These influences give a characteristic appearance to the political map of mediaeval Europe—"a peninsular interior, one mass of feudal principalities, 'confusion roughly organized,' separating two sea-systems to the north and south, and surrounded by a rim of states which, at various times, utilized its marginal seas as so many bases for political units."

The Hanseatic league, for long the dominant power, based upon the Baltic, in Northern Europe, was destroyed by two events, the migration of the herring, and the overseas discoveries. The fate of Venice was curiously similar, brought about by the necessity for land expansion to provide a stable economic basis, and the loss of the Oriental trade.

The Anglo-French dominion of the twelfth to fourteenth centuries based upon the Channel was made possible at that period by the isolation of Paris and the economic bonds between England and south-west France. In the eastern Mediterranean the control of the Aegean was the foundation of the Byzantine Empire. Mr. Darby shows how the maritime discoveries contributed to the "mare liberum" theory, and refers to this as indicating the disappearance of the

sea state from the political map; but it might be argued that it has not disappeared, that there has been a change of scale only: for example, France and her North African colonies, Japan and her spheres of expansion in Eastern Asia, and perhaps the United States and the Caribbean countries, seem to possess the same characteristics, except, of course, political sovereignty over the intervening seas. Further, the application of the term "state" to all the examples cited is perhaps misleading. This episode in mediaeval history might be regarded as a passing phase in the influence of sea power, rendered possible by the existing conditions of political sovereignty. South-west France continued to have relations with England after their separation, brought about by the growth of the French nation.

OBITUARY

PROFESSOR J. W. GREGORY, F.R.S.

It is with the deepest regret that we record the death of Professor J. W. Gregory, while leading an expedition in Peru. The party left England last January to investigate geological problems of the Andes and Amazon basin. As reported in *The Times* for June 14 last, Professor Gregory was drowned by the overturning of his canoe in the Pongo de Mainique rapids of the Urubamba river on a journey from Cuzco to Iquitos. We shall publish later an adequate appreciation of the geographical work of this distinguished scientist, who received the Victoria Medal of the Society in 1919.

DR. CUTHBERT CHRISTY

We record with deep regret the death of Dr. Cuthbert Christy on May 29 last in the Belgian Congo. It was later reported that he died after being tossed and severely gored by a wounded buffalo. He was seeking specimens of elephants on a tributary of the Upper Welle. Dr. Christy was well known for his journeys in Central Africa, and as an authority upon its natural history and diseases. He first went to Africa in 1898 as a medical officer with the West African Field Force, and served upon the Sleeping Sickness Commission sent out from England in 1902. Thenceforward he was constantly journeying through Central Africa. Several of these journeys he described in papers read before or communicated to our Society—notably his journey in 1912–13 to the Ituri river and Semliki valley, where with the assistance of Bambutte pygmies he obtained specimens of the okapi, followed by his exploration of the Nile–Congo watershed, and a later expedition to the Bahr el Ghazal to investigate its economic prospects. In 1930 Dr. Christy was appointed chairman of the International Commission set up by the League of Nations to inquire into labour conditions in Liberia. The geographical results of the consequent journeys were given in a paper read before the Society in March 1931.

Dr. Christy's best-known work was probably his 'Big Game and Pygmies,' published in 1924 with an introduction by Sir Harry Johnston, which described his experiences in the Ituri forest. He had been a Fellow of the Society since 1902, and received the Gill Memorial in 1919.

CORRESPONDENCE

GLACIATION AND CONTINENTAL DRIFT

In his letter on this subject (*Geographical Journal*, June 1932, p. 542), Professor Bailey Willis writes: "I am glad to state my entire agreement with Professor Coleman in his conclusion that the facts of Pleistocene and Permian glaciations are completely opposed to the theory of continental drift. . . ." It should, I think, be pointed out that Professor Coleman's conclusion was not this, but that the facts of these glaciations are opposed to Wegener's theories (*Journal*, March 1932, p. 253). It is perfectly clear from Professor Coleman's letter that the particular theories of Wegener to which he referred were those involving continental drift and polar wandering as an explanation for former ice ages, and "especially for the widespread glaciation in Permo-carboniferous times." In the last sentence of his letter Professor Coleman specifically stresses the aspect of causation when he writes, "what caused the development of great ice-sheets at the end of the Palaeozoic in regions now tropical remains as mysterious as ever." With this statement most geologists will readily agree. Professor Bailey Willis however leaves this safe ground of agreement far behind when he confuses the cause of glaciation with the evidence for continental drift. Continental drift should not be inferred from the fact that glaciation occurred, but from the distribution of the glaciated tracts in relation to other climatic evidence dating from Upper Carboniferous and Lower Permian times. The evidence is well known and need not be repeated here (see the *Journal* for November 1931, pp. 442, 450). It does seem necessary however to emphasize the point that proving Wegener to be wrong is by no means equivalent to disposing of continental drift, or, as Dr. S. W. Wooldridge put it, that the concept of continental drift does not stand or fall by Wegener's presentation of the case.

ARTHUR HOLMES

The University, Durham. 10 *June* 1932.

MEETINGS: SESSION 1931–1932

Annual General Meeting, 20 June 1932. The President, Admiral Sir William Goodenough, in the Chair.

The Hon. Secretary (Mr. W. L. Sclater) read the Minutes of the meeting held on 22 June 1931, and the Minutes of a Special General Meeting held on 14 January 1932, which were confirmed and signed by the President.

Before proceeding to the presentations the PRESIDENT said: Pray allow me to express to you, Signor Mameli, the great sympathy of myself and this Society in the loss that you have sustained by the death of His Excellency the Italian Ambassador.

His Majesty has approved of the Patron's Medal, which bears his effigy, being given to His Royal Highness the Duke of Spoleto. This is a recognition on the part of this Society of the admirable work done by His Royal Highness when he led the Italian Expedition to the Karakoram in 1929, and not only that, but for his preliminary visit to Askole the year before, when he took up a large amount of stores and made the necessary reconnaissance which ensured success. This expedition resulted, among other things, in joining up with the route of Sir Francis Younghusband in the Shaksgam Valley and later tracing that valley above the Urdok Glacier. It is agreeable that the long association of this Society with the Royal House of Savoy should be continued in a younger generation

The Duke of Spoleto has sent a telegram explaining that his naval duties make it impossible for him to come to London to receive this Medal. I will ask Signor Mameli to receive it and convey it to him.

Signor MAMELI: Mr. President, My Lord, Ladies and Gentlemen: My pleasure in having the honour of representing H.R.H. the Duke of Spoleto at this function is shadowed by the sadness of the circumstances which caused me to be here to-day in place of my late Ambassador, to whose memory your President has dedicated such moving words.

In receiving the Patron's Medal which your Society conferred upon His Royal Highness for his expedition to the Karakoram, I have the honour to express His Highness's deep regret for having been unavoidably prevented from attending this ceremony, and his great appreciation of an award which is all the more valuable as it comes from the Royal Geographical Society, and is therefore the highest acknowledgment which an explorer and a scientist may desire.

The PRESIDENT: Mr. Watkins, His Majesty has approved of the Founder's Medal being awarded to you, for your work of investigation, exploration, and research in the Arctic, culminating in the British Arctic Air Route Expedition of 1930–31. I believe that you are the youngest man who has ever received a Royal Medal of this Society. You have, Mr. Watkins, placed yourself in the front rank of polar explorers. We wish you well in the minor expedition that you are going to lead in Greenland, and we hope that in the future you will be enabled to carry out that great project in the Antarctic which I know fills your mind.

Mr. H. G. WATKINS: I want to thank you very much indeed, Mr. President, for this great honour. I am particularly pleased to receive the Founder's Medal of this Society, since the Society has always given me much help in all my expeditions, not only grants of money but also the loan of instruments and the great interest always shown by those working in the Society's house. I have been lucky enough to receive the Medal, but the real credit for the success of my expeditions is really all due to the members of those expeditions. Again I thank you very much indeed.

The PRESIDENT: In the regretted absence of Professor Coleman I invite you, Mr. MacLeod, as representing the High Commissioner for Canada, to accept the Victoria Medal which has been bestowed on Professor Coleman for his contributions to the geography and geology of Canada. The reason for Professor Coleman's absence is a very proper one: though at the age of eighty, he is at this moment pursuing his researches in the field for the Canadian Government. Professor Coleman's articles in our *Journal* in early days, on glaciology and mountain forms in the Canadian Rockies and other matters, have been of the greatest value to us, and we are proud to number him—a Professor of Geology in the University of Toronto and President of the Royal Society of Canada—among our Medallists.

Mr. MACLEOD: Mr. President, Ladies and Gentlemen: It is my privilege to represent the High Commissioner on this occasion. Mr. Ferguson asks me to express his sincere regret that he is not able to be present to-day, but he is at the moment engaged in affairs of State at Lausanne.

The Victoria Medal, which the Royal Geographical Society has awarded to Professor Coleman, is a much coveted honour. It is, I understand, not granted annually, but rather from time to time to those who have performed signal services to the science of geography. It is not necessary for me to recount the investigations and explorations Professor Coleman has carried out, for these are, no doubt, well known to you. The tribute to his work now rendered by the Royal Geographical Society, whose authority in matters geographical is recognized and respected in every civilized country, cannot fail to give the recipient

unbounded pleasure. It is, indeed, a much-prized mark of honour that will be greatly appreciated, not only by Professor Coleman, but by his fellow Canadians. The Royal Geographical Society has many connections with the Empire Overseas, and it is recalled with pleasure that a former President of the Society (Sir Francis Younghusband) was the guest speaker of the Canadian Geographical Society at its first public meeting in January 1930. We hope that these pleasant associations will be the forerunners of others, and that they will be multiplied in the years to come.

Mr. President, Ladies and Gentlemen, it gives me very great pleasure to receive the Victoria Medal on behalf of Professor Coleman. The High Commissioner will be most happy to transmit it to him, together with an account of to-day's proceedings. I imagine Professor Coleman may have one regret in connection with this award, and it will be, I venture to say, that he was not able to be present in person to-day so that he might express his thanks for the generous recognition accorded by the Royal Geographical Society. I am sure he would wish me to convey to you his most cordial appreciation.

The PRESIDENT: Dr. Sandford, the Murchison Grant has been bestowed upon you for your official and personal work for the Commission of the International Geographical Union on Pliocene and Pleistocene terraces. The work which you have carried out in the Valley of the Nile with your American Colleagues from the Institute of Chicago has been most valuable, and we remember that you were a member of Mr. Binney's Oxford University Arctic Expedition to North Iceland in 1924, and wrote on its geology and glaciology for our *Journal*.

Dr. K. S. SANDFORD: I thank you, sir, and the members of Council for this very generous award. It is a great honour to be recognized by this Society; in fact, it is a stimulus to one's enthusiasm. Thank you very much.

The PRESIDENT: The Back Grant is presented to you, Mr. Clutterbuck, for your leadership and work in the Oxford Expedition to Akpatok Island. These expeditions are, in our opinion, of immense value, especially when, as they were in your case, they are composed of young men prepared to give up their Long Vacation to such interesting work. And in making this presentation I assure you we remember your work in Spitsbergen and the fact that you accompanied Mr. Kingdon Ward on one of his expeditions to the China and Tibet border.

Mr. H. CLUTTERBUCK: I thank you for this award which I feel I have hardly deserved, except that it has been my desire in the past and it is my hope in the future to be able to take such interest in expeditions of graduates from the Universities as I think are to the advantage of geography in general. Thank you, sir.

The PRESIDENT: Miss Caton-Thompson, the actual work for which the Cuthbert Peek Grant is given to you is your investigations into the historical geography of Lake Moeris, a description of which you were so kind as to give us in November 1928. It has been a great satisfaction to see the distinction which you have won by your investigations for the British Association of the Rhodesian Ruins and also for us by your research into the Kharga Oasis. You would wish, as we would wish, to associate with yourself the name of your colleague, Miss Gardner.

Miss CATON-THOMPSON: I thank you, Mr. President, very much indeed for the honour which the Royal Geographical Society has conferred on Miss Gardner and me with the presentation of the Cuthbert Peek Grant. With the other recipients of awards to-day, I can only say that I am deeply conscious that the leader of an expedition owes an enormous amount to the loyalty and hard work of his or her colleagues and can only actually receive an award in the name of those who have done, probably, more of the work than one has oneself. I say

that particularly with regard to Miss Gardner's very active share in the work which you have been so kind as to reward. Thank you, sir.

The PRESIDENT: The Gill Memorial is awarded to you, Dr. E. B. Worthington, for your studies of the East African Lakes. These were described by you at a meeting in the early part of this year, which we all greatly enjoyed, and an account of your activities will be found in the *Journal* for April 1932. We recognize that part of your work on the Central Island of Lake Rudolph which had not before been visited; and the work also on Lakes Edward and George and the very interesting Kazinga Channel is much to your credit.

Dr. E. B. WORTHINGTON: Thank you, sir, and your Council, exceedingly for this award of the Gill Memorial, which I take as a great compliment not only to myself but to the other members of my expedition. Moreover, I feel that it shows admirably the wide-mindedness of this Society in that the objects of our expedition were not essentially geographical, geography being treated rather as a means to an end.

The PRESIDENT then delivered his Anniversary Address, which is printed on p. 97.

The visitors having withdrawn, the PRESIDENT appointed Mr. H. StJ. B. Philby and Mr. Augustine Courtauld to act as Scrutineers of the Ballot for the President and Council for the ensuing year.

In moving the adoption of the Annual Report of the Council, the PRESIDENT said: It is satisfactory to note that our Budget is balanced, and that to the extent of about £450. You will notice that the placing to the repayment of debt of one-third of the compositions has been withheld this year. That has been done in order to tide over what has been, owing to a falling-off in the number of Fellows, a somewhat difficult situation. We have however nothing to fear financially. The Budget for 1932 was arranged on a reduction of £2000 on the estimate of 1931 and of £1000 on the takings of that year. Although it is early to make calculations, it would appear that the candidature has been so good that we shall not be more than £300 or £400 down on the 1931 receipts.

I take this opportunity of expressing, on behalf of the Society, their thanks to the staff for having accepted, with such hearty goodwill, a reduction of 2½ per cent. on their salaries. There has also been a 10 per cent. reduction on the *Journal*, and a similar proportion on the Library, the Map Room, and the expeditionary funds. Naturally, it is hoped that if things go well in future years we may be able to restore those amounts to what they were. I may mention here that the Council has been able to rescind that reduction, to a certain extent, on the issue of maps in the *Journal*. It was felt that that was a very important part of the work of this Society, and that the first thing, if possible, that we could go back to would be the fuller printing and issue of the maps.

The Kensington Gardens Mansions did not exercise their option in the direction of paying off the £40,000, and it became necessary to make a new arrangement, a record of which will be found on p. 7 of the report. Generally speaking, that arrangement is advantageous to the Society. It is very clearly set out in the report, but if Fellows would like me to say a word or two about it they have only to ask. You will note that I appointed a Special Committee consisting of Sir Matthew Nathan, Sir Harcourt Butler, Viscount Goschen, and Mr. Francis Rodd, together, of course, with the Treasurer, to look into the matter and to advise the Council. I think we may say that with the advice of such a Committee we were, as I was told by an important banker, in very safe hands. Would you like me to add anything on the subject?

Members having expressed their satisfaction with the information already contained in the report, the PRESIDENT put the motion to the vote and declared the Report adopted.

Mr. H. StJ. B. PHILBY reported that as a result of the Ballot all the Candidates proposed by the Council had been unanimously elected by the Meeting (see List, p. vi).

The proceedings then terminated.

THE ANNIVERSARY DINNER

The Anniversary Dinner of the Society was held at the Connaught Rooms on Monday 20 June 1932.

The President and the Hon. Lady Goodenough received the company, which included, among the Guests of the Society: the Viscount and Viscountess Hailsham, the Premier of Southern Rhodesia, Sir John and Lady Maffey, Mr. Anthony Eden, M.P., and Mrs. Eden, Vice-Admiral Sir William and Lady Fisher and Miss Fisher, The Vice-Chancellor of the University of London, The Principal of Hertford College, Oxford, The Regius Professor of Physic at Cambridge and Lady Rolleston, The Bishop of Croydon and Mrs. Woods, Mr. H. G. Watkins, Dr. and Mrs. K. S. Sandford, Mr. and Mrs. Hugh Clutterbuck, Miss Gertrude Caton-Thompson, and Dr. and Mrs. E. B. Worthington.

After the loyal toasts had been honoured, The VISCOUNT HAILSHAM, proposing the toast of the Royal Geographical Society, said: When your President was good enough to invite me to propose this toast he modestly wrote to say that all he was asking me to do was to present to this assembly some entirely original idea or thought by which geography in its broadest sense might contribute to the progress of the world. I was still a little dazed by that request when, a day or so afterwards, I received a letter which I thought for a moment had supplied me with the missing original thought. The letter came covering a book entitled 'Does the Earth Rotate?' and the writer explained that the book proved conclusively that all existing ideas of geography were entirely ill-founded. The Earth, so the book conclusively established, was a fixed and flat surface; the sun was not 93 million miles away but 9500 miles away, and its diameter was something less than 10 miles. Being nothing if not up to date, the author went on to point out to me that as a member of the National Government pledged to economy I ought to make it my duty to publish this new discovery because it would involve a great economy in all our schools in that it would abolish the necessity for the use of globes. Well, I was very much struck with the idea, but I reflected that if the author was right, how was it that I had come round the world only two and a half years ago? As I have not been able to find the solution to that question I am forced to abandon his theory.

I next devoted myself to the study of the circumstances under which this Society was originally founded. As you all know, it happened one hundred and two years ago—in 1830. In the Minute which describes the origin of the Society there are three reasons given why such a Society as this is necessary and desirable. First, because geography is a "species of knowledge obtainable without much difficulty"; secondly, because "it affords a copious source of rational amusement"; thirdly, because such knowledge of the science as then existed was scattered in the bureaux of public departments and therefore unavailable to the ordinary public. At this time in our era you will, I am sure, readily recognize that none of those reasons has any real foundation. I am quite sure that neither Mr. Watkins nor the Duke of Spoleto would agree that geography is "a species of knowledge obtainable without much difficulty." No one who has been to school would ever describe his geographical lessons as "a copious source of rational amusement." And as to the material in the bureaux of Government departments not being available to the public, why, in spite of Lord Hewart and the new despotism, what is the Secretary for War to do except to remind you of

the Ordnance Survey maps? Those reasons will not do. My originality shall lie in finding new ones.

First, as a soldier, or at any rate as the head of a department which deals with military affairs, let me remind you that geography is vital to the military art. Geography was largely discovered by soldiers. We remember how in the Middle Ages Cesare Borgia employed Leonardo da Vinci to map out portions of Italy in order that he might later more easily conquer them; how later on the best maps in Europe were those which Louis XIV prepared of the frontier districts just outside the boundaries of France, and how, a little later on again, Frederick the Great and his successors devoted a great deal of time and money to the preparation of accurate maps of the districts which they were going to conquer. It is recorded of our own people that a certain Duke of Newcastle, something like one hundred and eighty years ago, sanctioned an expedition to Cape Breton and was very much disturbed later to find that he had captured an island instead of the starting-point for the continents. Even during the Great War a friend of mine serving in one of our expeditions found himself greatly embarrassed by the fact that the maps supplied by a certain department indicated the railways just 50 miles nearer than they actually proved to be. There is no doubt that geography is an important adjunct to the military art. But in these days of disarmament I hardly dare refer to military affairs as justification for anything—even for my own existence. Let us think of something more popular.

Let us go back to my older profession of the law—always the most popular of all. In the law we regard geography as a most important subject because every one knows that disputes about boundaries are the most prolific and one of the most profitable sources of litigation. I need not remind you how such international arbitrations as those concerning Alaska or the timber areas in Eastern Canada have turned upon the precise legal significance of geographical terms.

And if we pass from the lawyers to the politicians, as popular as and much more permanent than the soldiers, how can a politician get on without knowing geography? It is on record that in the days of the Berlin Congress in 1878, when the Russians were about to take as much as they could of Turkey and our diplomatists were trying to prevent them, the Russian plenipotentiary, M. Gottchakoff, was furnished with two maps, one showing the maximum demands of Russia and the other the minimum demands, and being a poor geographer and somewhat short-sighted, he produced the minimum demands under the impression that they were the maximum. Fortunately, this country was represented by Lord Salisbury, who at once appreciated what had happened, and, by his ready acceptance of M. Gottchakoff's terms, greatly facilitated subsequent negotiations. I think I am right, am I not, in attributing to Lord Salisbury the famous aphorism, "For God's sake, gentlemen, study large-scale maps"?

And even after the Great War a very well-known British politician at the conferences at Versailles, when the fate of an island called Nauru was very much in the balance, desired to know why that should not be determined by applying the principles of self-determination, under the impression that it formed a portion of the Balkans, whereas, as you all know, it is a sparsely inhabited island in the Pacific containing phosphate deposits. And at the same conference there was, as you will also no doubt remember, a line drawn attributing certain German possessions north of that line to Japan and others south of the line to other Powers; and it was only after the treaty had been signed, sealed, and delivered that the United States discovered that in the area north of the line lay that island which acted as the focal point of all their cable communications, and that they had handed over to Japan complete control of all their communications with the East. It is a very useful thing to know a little geography.

I do not know that the literary world suffers so much from absence of accurate geographical knowledge. You remember that Shakespeare makes one of his plays take place on the coast of Bohemia! And I can remember that one of the greatest of our living writers, Mr. Rudyard Kipling, wrote a poem about

> . . . the road to Mandalay,
> Where the flyin'-fishes play,
> An' the dawn comes up like thunder
> Outer China 'crost the Bay!

That completely deceived me and destroyed the whole of my plans for a trip to Burma, because I relied on him in thinking that when I once got to the coast of that country I should be somewhere near Mandalay.

What about the most important people of all? What about, first of all, the Empire-builders? I wonder how much the empires of the world depend upon the geographers and explorers of the world. Where would Spain's Empire have been without Christopher Columbus? Would France have had two hundred years' domination in Canada but for Jacques Cartier? Even on Saturday last at the Aldershot Tattoo I saw the reproduction in phantom of Captain Cook landing in the Pacific Islands and hoisting the British Flag. And we all know how much this maritime nation owes to the explorers and adventurers of the sixteenth, seventeenth, and eighteenth centuries who played their part in painting a quarter of the habitable globe red at a time when that colour had no political significance.

Last, and most important of all, what about the industrialists, people we all defer to in these days? There is a story in the Colonial Office of how just before the war there came a deputation of eminent industrialists, anxious to develop our Colonial Empire, in order to acquire information as to the precise whereabouts of the most suitable ports of Northern Nigeria. Again, in this Society, I need not remind you that the north of Nigeria is completely land-locked. But even nowadays, and quite seriously, I am not sure that the great help of geography may not lead up to the industrial and economic expansion of our trade and industry. The geographer can point out to the industrialist where are the most favourable sources of communication between different parts of the world; when economic barriers are being erected he can point out what are the physical barriers and what are the natural lines of junction, the natural lines along which trade can flow; he can explain where the physical characteristics of a country invite economic development on some new lines and where, in fact, trade and industry may be developed in ways which a little imagination may point out but ignorance of geographical conditions may well make impossible. I think it is to the industrialist that the geographer can render the most signal service.

We have moved a long way since one hundred and two years ago. Even in my own youth the Poles had never been seen by human eyes. Africa was still the darkest unknown continent, and it was still possible to say, in the words of Swift, that

> Geographers in Afric maps
> Make savage pictures fill their gaps,
> And o'er inhabitable downs
> Place elephants in place of towns.

That was true when I was a boy. To-day, east and west, and north and south, Africa has been explored and discovered. Towns are springing up; farms are settled; industries are established; railways are built in what was a dark and unknown savage interior. To-day Africa is as well known as a great many parts of Europe.

It is much easier for the geographer to-day, in some ways; the development of aerial travel and the invention of new photographic devices have made possible a speed and accuracy which could not have been dreamt of when your Society was founded. Greater frequency of travel; new methods of passing over the surface of the globe, have made geography more important than it ever was. To-day there may not be quite so many new fields to conquer, but I am quite sure that it is still true that geography is a science full of interest to the student; which still offers fields of adventure and romance to the explorer, and is of vital interest to the politician and the industrialist. Your Society deserves well of your country because you are encouraging and fostering a science which may bring wealth and prosperity to our island, even in these difficult days.

Ladies and gentlemen, I am afraid I have not achieved the original thought, but I have at least offered to you a very sincere tribute to the work which you are doing. I ask you to join with me in drinking the toast of your great Society, and I ask you to couple with that toast the name of your President, Admiral Goodenough, who, after a distinguished naval career, has identified himself with the interests of this Society. For two years already and now for a third year he has honoured it by becoming its President and, by his presidency, brings fresh lustre and fresh distinction to the Society. I give you the toast of the Royal Geographical Society.

The PRESIDENT, in responding, said: Men well versed in the affairs of the world and taking a prominent part in those of our own country come to our Anniversary Dinner in successive years to wish us well. We have been very fortunate, and never more so than to-night, for in Lord Hailsham we have a man on whom and on whose word all rely. I thank you most warmly, Lord Hailsham, for coming here to speak to us and to be our guest on this occasion. I was not wrong when I asked you to produce some new and original thoughts. You have put before us what we believe to be the ultimate aim and object of our Society. It is quite true that exploration, travel, and adventure form one of our principal activities, but the object, in the end, is that we should be of some benefit to the human race and to our own country. You may be well assured that we shall all bear in mind, with great care, the thoughts you have put before us.

I understood from the few books I have had the opportunity of reading that that Russian gentleman you speak of went somewhat further, and that when confronted with the mistake which his compatriots thought he had made he was found with a pencil drawing a line across the map. When the Englishman who found him said, "Your Excellency——?" he replied, rubbing his eyes, "How clever you English are!"

This day of annual meeting may be divided into two parts. In the afternoon the President, after making those presentations of which you will hear in a few moments, renders an account of the stewardship of himself and the Council to the Fellows of the Society and gives some description of what has happened during the past year. In the evening, acquitted or at any rate whitewashed and either succeeded or re-elected—and I take this opportunity of thanking the Fellows of the Society for the confidence which they have reposed in me for another year—he rises to reply to the toast of the Society and to say something of the future.

But I am going a little too fast, for there are two events of the past year to which I will refer again. One is that Her Majesty the Queen, after the visit of Their Majesties to our building and Society, has, with the consent of His Majesty, our Patron, made a closer connection with the Society than has hitherto been the case. That is a great pleasure and a great honour. The second, somewhat more material, is that we have balanced our Budget. That has not been done without

a certain amount of sacrifice, and I take this opportunity of repeating what I said this afternoon as to the deep debt of gratitude which every Fellow of the Society owes to our staff in having accepted in so loyal a spirit the small reduction, I am glad to say, but the reduction which they were called upon to make in their salaries. Never had a Society a more loyal staff.

What of the future? I was very glad to hear you say, Lord Hailsham, that you were one of those who saw that it was possible to have further adventure, fresh travel, and so on. I have said before, and I have every intention of saying again—one of my most distinguished brother officers said that reiteration was the sign of conviction—that I do not believe for a moment that the whole of the world has been uncovered. I heard some one only a fortnight ago, speaking of one of those great accomplishments of travel which have been made lately, and which will be made again, say—I am sure many here can hear him—"The last veil has been torn from the face of the Earth." Not at all. There is much of the world still hidden, and we in our Society are among the first, I hope, to encourage and assist the violation of the occult. What will you have? Something physical? Is the Antarctic continent one piece of land or two? I am glad to say I have no fear here of anybody replying, "Oh, is that important?" That is as people like to think. I remember asking Sir Douglas Mawson how a whale evidently harpooned on one side of the Antarctic continent had reached the other, where he was caught. Sir Douglas said, "Anyhow, it didn't come under the Barrier." Well, I wonder. Is it possible that the Antarctic continent is two pieces of land joined together by a great ice-cap, with a channel of water between? We look upon it as a matter of some importance that we should know the answer to such a question. We have the man who could supply the answer. You may have read his letter in *The Times* this morning. We can find the equipment. We have the instruments. I will not attempt at this hour of the evening even to give a name to it or to explain it, because I do not understand it, but we have an instrument which can tell what the depth of the ice is. That instrument is to be tested in Iceland this year. We look forward one of these days to the man of whom I speak landing one side of the Antarctic continent, say, at Weddell Sea, and coming out either at the Bay of Whales or at MacMurdo Sound.

Or would you have a human problem? How many millions of people can be accommodated, shall we say, in the centre of South America—I do not say to the west, but on the Matto Grasso south of the Amazon. It is a fine problem for investigators to find room for the millions of surplus populations. I spoke of that last year.

You would not expect me to mention Brazil without saying something of Colonel Fawcett. A party has gone—I saw most of them before they started last Saturday—not with the avowed intention of searching for Colonel Fawcett but certainly with the intention of trying to ascertain what his fate was. Composed as they are and led by Mr. Churchward, I should say that they have as good a chance as anybody else of finding out what Colonel Fawcett's fate was. In any case they will bring back much that is very valuable to us geographically, for I was glad to be able to persuade two of the party—Pettiward and Skeffington Smyth—to take a considerable amount of instruction from Mr. Reeves. People say it is a horrible place, but when I said to Mr. Churchward, "And yet things grow there," he said, "Grow? Why, you have only to put a walking-stick in the ground and it will grow." I heard to-day that we shall be able to publish in the *Journal* before long an account written by an American gentleman who knows that part of the world well and has considerable evidence. I take this opportunity of thanking you, Mr. Eden, for the kindness which the Foreign Office has shown us in all this matter. I do not think personally, having looked through all the

evidence, that there is very much chance of Colonel Fawcett being alive; but all things are possible.

To return. Would you like some historical geography? You have heard Lord Hailsham speak of military and historical maps. If anybody wants a good adventure let him go to the east of the Yemen—I am a little diffident when I see Mr. Bertram Thomas and Mr. Philby here—and bring back what he can find by investigation of the old Sabaean sites and civilization. I have heard from Mr. Douglas Newbolt that all sorts of most interesting alabasters, coins, and plaques are being sent to Port Sudan. Those who, in the admirable phrase of Sir Francis Younghusband, are "well accepted by the people," will, if they go to that part, find things of great interest.

Or, if you prefer something more like an accomplishment, I have been asked more than once to remind this Society that the Everest Committee is still in being, and the fact that two of our countrymen lie at or very near the top gives us, perhaps, a priority, when the opportunity occurs, of again making the attempt to climb the heights of Everest. The veil has never been torn from that great peak.

If I look to the next Session only I see much of interest that we can put before the Fellows and those they care to bring to our meetings with them. The Asian lecture we hope will be delivered by Sir John Hope Simpson himself on "China's Floods: their Cause and Consequence"; and I hope, Mr. Eden, you may be able to come to that lecture if it is only to clear up that very knotty problem which I understand you are arguing with one of your Parliamentary colleagues, as to whether the Han river or the Yang-tze-kiang carries most of the trade of Hankow.

I have spoken of South America, and we have, further, two men who have been studying and are now studying in South Africa the northern slopes of Ruwenzori, namely, Count Xavier de Grunne and Mr. Humphreys, and there are others, too. So I hope, you see, Lord Hailsham, that we are paying attention to all that adventure which forms a portion of the incentive that we put forward in this Society.

There is one more matter which I would mention where the past and the future are intimately connected. Last January there was unveiled a statue now standing on the eastern wall of our building, a statue of Shackleton which appears to many of us an inspiration. The unveiling was accompanied by a fitting ceremony. Two speeches were made, one by the past-President of our Society, who is here to-night, one by that world-wide authority on Polar research and exploration, Dr. Hugh Robert Mill. As showing how far-reaching such representations and speeches are, I have a letter by me from a Fellow of this Society who, having described how much she had enjoyed reading those speeches herself, added, "I believe that even those two great men would have been thrilled if they could have seen a party of young Canadians huddled up in their cold schoolroom listening, with breathless interest, to the extracts of the speeches of Lord Zetland and Dr. Mill that I was able to read them."

The niche on the northern side of the wall is empty, and naturally it has been much discussed as to how it should be filled. Some suggest Hanno, others Ptolemy; Ibn Battuta had his supporters, and Francis Drake. But, speaking for myself, I believe that when that niche is filled with the effigy of David Livingstone, in all the rugged simplicity of his mind and character, that those two will be an outward and visible sign of the spirit of geographical research and travel, and also that of human interest and progress that actuates the movement of the Royal Geographical Society.

The MARQUESS OF ZETLAND, proposing the toast of the Medallists, said: I rise to propose the health of the recipients of the Medals and Awards, and, in doing

so, the first observation which I would make would be this: That if those who have received Medals and Awards are to be congratulated upon the achievements which have won for them this recognition on the part of the Royal Geographical Society, as indeed they are to be congratulated, the Society itself is also to be congratulated upon the striking impartiality with which it has distributed its favours amongst the claimants. Youth and old age, Briton and foreigner, male and female, figure in the small and select list of those whose health we are about to drink.

Mr. H. G. Watkins, for example, is, I suppose, quite the youngest explorer who has ever received the Gold Medal of this Society. He had not, in fact, reached what are usually, though not necessarily correctly, described as the years of discretion when he led the first of that series of expeditions, the expedition to Edge Island, for which he has been awarded the Founder's Medal. It is possible that some of you had not, until then, heard of Edge Island. It is possible that you are not, even now, very greatly drawn towards it. It is, in fact, as Mr. Watkins has himself confessed, a portion of the surface of this planet of singularly little attraction. It lies to the east of Spitsbergen, but it is bleaker than Spitsbergen. It possesses less animal and vegetable life than Spitsbergen, and it is scenically duller than that country. Add to this, says Mr. Watkins, the fact that bad gales and bad fogs are common on and around Edge Island, and you will have a picture of a land which has few comforts or attractions with which to beguile the explorer. All the more honour to Mr. Watkins and to his fellow-graduates and undergraduates of Cambridge University, who spent a Long Vacation in such an inhospitable spot discovering all that there was to be known about it.

Since then Mr. Watkins has, of course, led two further expeditions of a more ambitious character into Arctic regions, the object of the most recent being to discover the possibilities of an air-route between Great Britain and Canada *via* the Arctic, thus avoiding the long and perilous sea passage associated with the more obvious route across the Atlantic. Surely we may say with truth that at a particularly youthful age Mr. Watkins has laid the foundation of a great career as an explorer.

Now, by way of contrast with the youthfulness of the winner of the Founder's Medal, consider for a moment the rich maturity of the man who has been awarded the Victoria Medal. Professor Coleman, for forty years Professor of Geology at the Toronto University, President of the Royal Society of Canada in 1921, celebrates this year his eightieth birthday. He would have been present with us to-night but for the fact that, octogenarian though he is, he has undertaken an extensive piece of field work on behalf of the Canadian Government. Much of the work of this distinguished geographer bears upon those puzzling periods in the evolution of this Earth which are known as the Ice Ages. Some of you will, no doubt, recall in that connection the theory of the late Dr. Wegener. The Wegener hypothesis involved the shifting of continents and a considerable migration on the part of the Poles—not, of course, the inhabitants of Poland, but the Poles of the Earth's axis; and I fancy that there may be many who would be inclined to say of the Wegener Hypothesis what Mr. Stephen Coleridge says of the concept of a curved and finite but, at the same time, an expanding Universe which is put before us by astronomers of the school of Sir James Jeans, namely, that it is contrary to common sense. If so, you will find a powerful supporter of your views in Professor Coleman, who seems to me to have proved conclusively in a recent communication to the *Geographical Journal* that the theory of shifting continents and wandering Poles is quite inadequate to explain the known facts of the two greatest periods of glaciation of which we have knowledge. What, then, is the cause of these unexpected Ice Ages? Ladies and gentlemen, it is a

little disappointing to find from Dr. Coleman that while the Earth movements predicated by the late Dr. Wegener are certainly not the cause, the actual cause of the sudden appearance of great icefields in countries which are now tropical remains as much a mystery as ever.

I now come to the distinguished explorer who has been awarded the Patron's Medal, H.R.H. the Duke of Spoleto, a relative of another distinguished Italian explorer, the Duke of the Abruzzi, who received the Founder's Medal of this Society some years ago. His Royal Highness led a large and particularly well-equipped scientific expedition into that fantastic world of ice and snow from whose midst rises that almost peerless mountain peak known to geographers as K2. His Royal Highness's more personal contribution to the results of that expedition was a stereogrammetric survey of the Baltoro Glacier, but to his powers of organization and his skill in leadership must also be attributed the successful outcome of a scientific expedition which, as was so well said by Dr. Longstaff in the course of the discussion which took place when His Royal Highness's paper was read before the members of this Society, has cleared up once for all the fascinating problem which was set to geographers by Sir Francis Younghusband forty years ago.

We regret that His Royal Highness is unable to be with us this evening, but let me assure him, in his absence, that we as Englishmen appreciate to the full the value of the achievements of a distinguished representative of a foreign but a friendly nation, which have been rewarded by the Patron's Medal.

It would be easy to speak at length of the work which stands to the credit of those who will receive the other four Awards of the Society; but time passes, and I can only mention, with great brevity, the nature of their work.

Dr. K. S. Sandford, who has received the Murchison Grant, was a member of Mr. Binney's Oxford University Arctic Expedition in 1924, but since that time he has been busy with other work, especially in the Nile Valley, and in 1928–30 he edited for a Commission of the International Geographical Union two admirable Reports on Pliocene and Pleistocene Terraces.

Mr. Hugh Clutterbuck, who has been awarded the Back Grant, has received that distinction in recognition of his expedition to Akpatok Island. So far as I know, no printed account of that expedition has yet been issued, but the verbal account which he gave of it to the members of this Society in February last leaves upon the mind the impression of an admirably conducted expedition to an island possessing singularly little attraction to the ordinary traveller.

Then Miss Caton-Thompson, with whom has been associated Miss Gardner, has been awarded the Cuthbert Peek Grant for investigations into the historical geography of Lake Moeris which, as I understand, is regarded by the modern Egyptian engineer as the earliest of those great irrigation works in the Nile Valley. The conclusions of these two investigators were set forth in a scholarly paper which was read before the members of the Society in November 1928. All I can say of their conclusions in the time at my disposal is that they seem to demand a drastic revision of the views which have been hitherto held upon their subject of study.

And finally, I come to Dr. E. B. Worthington, a Balfour student of the University of Cambridge, who has been awarded the Gill Memorial for his study of East African lakes, including a striking piece of work in connection with the Central Island of Lake Rudolph, never hitherto visited.

Well, ladies and gentlemen, I hope that in these brief and somewhat discursive remarks I have said enough to make it clear to you that all these persons have to their credit achievements of great distinction in the sphere of geography. I now ask you to drink their health and continued success in those particular fields in

which they have already won distinction. I couple with the toast the name of the most youthful of these explorers, Mr. H. G. Watkins.

Mr. H. G. WATKINS, responding for the Medallists, said: On behalf of myself and those to whom the Medals and Awards of this Society have been given, I want to thank you very sincerely indeed for the toast which you have just honoured. We realize what very great care is always taken in awarding these Medals, and we all of us, either personally or through representatives, thank you for this great honour. To-night I have the privilege and also the misfortune to have to speak for all the recipients concerned on this occasion. The Duke of Spoleto is at sea and Dr. Coleman in Northern Canada. I had hoped to be away on an expedition in the Antarctic. Actually I should not have minded where it had been so long as I could have avoided making this speech. However I have to speak for all of us, but I certainly feel very diffident about addressing such a distinguished gathering. Until a few moments ago I could not understand why I have been chosen, but after the remarks with regard to my age I have come to the conclusion that the fact that I have been chosen has something to do with the proverb: "Out of the mouths of babes and sucklings . . ."

All the recipients of awards have led expeditions, some of a large number, some of a smaller number, and we realize that though we have been lucky enough to receive the Medals and Awards the credit for the success achieved is really due to all the members of those expeditions. Speaking for myself, I have led three expeditions involving about thirty or forty men, and I realize I am responsible personally for only about a fortieth part of the work done on those three expeditions. Therefore I really feel entitled only to a fortieth part of the medal which I have received. However we all realize that the awards are made to us as representatives of various expeditions we have led, and I thank you in the name of the members of our expeditions.

You have heard something about the Antarctic. I had hoped to lead an expedition to the Antarctic this autumn to try to cross the Antarctic from the Weddell Sea to the Ross Sea, which was Sir Ernest Shackleton's plan in his 1914 expedition. I had hoped to take a certain number with me who had been on my last expedition. Unfortunately, owing to the financial crisis, it has not been possible to find the money for this expedition, and so the plans have had to be abandoned. But when a suitable time comes there will be certainly fourteen or fifteen people in England well trained in Arctic travel who will be only too keen to go on an expedition to the Antarctic.

Sir HALFORD MACKINDER, proposing the toast of the Guests, said: Most of the greater Societies have an Annual Dinner for the purpose of promoting and maintaining comradeship among their members. In the case of the Royal Geographical Society there is an additional reason why we should hold such a festivity. There is a club in London a condition of membership of which is, I believe, that you should have travelled 500 miles from the shores of Great Britain. We in this Society impose no such condition, and for a very simple reason. If you added together the itineraries of our six thousand members the total would surely reach almost astronomical figures! Taking us as a crowd we have received, I suppose, more hospitality in more parts of the world than any equal number of our fellow citizens. Of course the time was, even within the one hundred and two years referred to by Lord Hailsham, when we were "served up" on some hospitable occasions! But that fashion has, I am glad to say, passed, and we now enjoy the hospitality that is showered upon us. Once a year by way of token of our gratitude we like to entertain, when we can get them, some of those who have made our travels memorable to us.

There are present not a few guests of individual Fellows. I know that some

Fellows make a practice of inviting to this dinner, when they can, those who have heard the message "Come to Britain." Let me assure such guests that they are welcomed by all of us. We welcome them as representatives of the great host of our friends scattered over the globe.

But also it is the custom to invite certain guests on behalf of the whole Society. On the present occasion, if I may venture to say so, I think the list of those, our corporate guests, has been very well chosen. This Society has many contacts; geography touches many activities. We have this evening in the list of the guests of the Society representatives of the Government, of the Army, of the Navy, of the Foreign Office, of the self-governing Empire, and of the parts of the Empire which we rule in trust, of the Church, of Medicine, and of the Universities. Unfortunately we have not present representatives of foreign countries or of the Air Force. As you have heard already to-day, the Italian Ambassador, who should have been here, and whom we mourn, has gone on a long journey, and Colonel Shelmerdine, representing the Air Force, who should also have been here, is prevented by sudden illness.

It is my pleasing duty to commend to you this toast by mentioning to you some of our chief guests. First, we have Lord Hailsham, who represents a Government which more than any other Government on Earth must have the world-outlook. Their decisions have repercussions which pass round the world and come home to their starting-point.

It is often said that we acquired this Empire in a fit of absence of mind. We certainly acquired it by wandering up and down the Earth. I am not quite sure how far a knowledge of geography in the Cabinet Chamber has been responsible for the achievement. The time was when some at least of the schools in which Cabinet Ministers were trained prided themselves on the fact that they did not teach geography. I remember an occasion when a number of geographical enthusiasts were bemoaning the ignorance of such schools; after a series of laments an American rose and said he had listened to a very dismal story, but he had been to Gibraltar, and to Malta, and to Suez, and to Aden, and to Colombo, and to Singapore, and to Hongkong, and he had come to the conclusion that there was a horse-sense of geography somewhere in the British Empire! The difference is, I think, that whereas in former times the British Empire was acquired by the men on the spot, and as often as not given away by the Cabinet, we have now reached a condition of things in this shrunken world when it will go ill with us if geographical considerations do not enter into the decisions of our Cabinet.

While Lord Hailsham presides over the War Office let us hope that he will not have to come to us for help for strategical purposes, but through him we would like to thank that great corps of the Royal Engineers, which has been lately so admirably represented on our Council by our late President, Sir Charles Close. We owe a great deal also to the Hydrographical Department of the Navy, and to-day we are beginning to owe not a little to the use of photography by the Air Force.

We have another minister present in Mr. Eden, the Under Secretary for Foreign Affairs. The practice used to be in the days, for instance, of Lord Curzon that you travelled first in order to become a minister; to-day you became a minister, and then you go on your travels. The result is that whereas we used to think rather small things of Under Secretaries, now we shall have to regard it that every minister leaves his partner, in the shape of the Under Secretary, to carry on while he is absent. With absentee ministers there is a real chance for Under Secretaries. I am sure we all hope that by and by Mr. Eden will have the opportunity to travel.

Then we have present Mr. Moffatt, the Premier of Southern Rhodesia. You

will recognize that surname. I believe I am correct in saying that Mr. Moffatt carries on the family which was so closely associated with Dr. Livingstone. It is a wonderful thing when you come to think of it that I, and no doubt others present, heard that great hunter, Selous, introduce to this country, practically for the first time, the names of the Matabele and the Mashona. To-day Mr. Moffatt is Premier of a community which is already no longer a colony, though not yet quite a dominion. Mr. Moffatt represents a self-governing portion of the Empire which not so many years ago was wild Matabeleland and Mashonaland.

We have also present Sir John Maffey, who governs the Sudan; he also is in a position betwixt and between, for I believe two flags fly in the Sudan! So we have this evening in this Premier and this Governor, whom we are very pleased to honour, representatives of the elastic organization which characterizes our Empire—no bad thing, provided always that you recognize the facts of geography!

I turn now to the Bishop of Croydon. We geographers owe to the Churches that great and romantic contribution to the history of discovery which has been made by the missionaries. But this evening I am not going to dwell on that, because I have to say a rather serious word to the Bishop on another matter. I understand that there is something defective in the frontiers of his Diocese! Apparently they just exclude the home of our President! I remember Lord Bryce telling me that Kilimanjaro was included in what is now Tanganyika Territory by a small but significant deviation of the frontier which was adopted at the express desire of the German Emperor. Will the Bishop perhaps take note that frontiers are not always natural: they sometimes go by favour!

I pass to the representatives of the Universities. Fifty years ago they would not have been here, but geography is an advancing science. It is not only that we believe we have taught the Universities something, but I venture to think, and still more hope, that the Universities are in turn going to strengthen a valuable strand in our geographical argument. There is adventure and, to the end, that will appeal to the imagination of all of us. There is survey and cartography, that endless subject which has to begin afresh every day, for there are always new facts to be taken into account. The map of the world is one of the most wonderful monuments of human industry that exists; it is a compilation of myriads of scientifically ascertained facts. But there is yet a third strand in our cord, which a late President of this Society, Dr. Hogarth, used to call philosophical geography. The pioneer leads; precise science follows; and finally you apply what you have learnt not merely to human utilities, but also to the illumination of the human mind. There is to-day a continuum, the four dimensions of space and time, geography and history, and it takes a trained grasp of brain to seize and hold, in order and not chaos, the data of our modern existence on this Earth. Well, we have here to represent the science and philosophy of geography distinguished members of three Universities. We have the Regius Professor of Physic from Cambridge, who represents not merely Cambridge but also Medicine. Who shall say what we geographers owe to modern medicine? We also have with us the Principal of Hertford College, Oxford. My old University was the first to co-operate with the Royal Geographical Society in the modern movement for geographical education, and is the last to create a professorship of the subject. That has happened partly by accident, but I venture to think that there is a certain rightness in it: our oldest University showed its continuing youth by entertaining a new study, and showed its maturity by waiting to crown a national movement. Then we have the Vice-Chancellor of the University of London The University of London presents a geographical study in itself! Are not its colleges scattered over some 600 square miles, and are not its examinees in every climate of the world?

Lastly, I am going to ask you to associate with this toast the name of Vice-Admiral Sir William Fisher. There are two very great positions in the world beyond our shores which can only be held by men of our race and our citizenship: the one is the Vice-Royalty of India; the other the Command-in-Chief in the Mediterranean. Two extraordinary positions! How extraordinary is the Vice-Royalty of India we all realize; but think of the Mediterranean! We are there a Great Power, and the whole of our territory is a rock and two stormy teacups, Malta and Cyprus. On your behalf I wish Admiral Fisher success in the great position to which he goes this autumn. Some thirteen years ago I was being carried in one of His Majesty's ships along the coast of Asia Minor, and Admiral de Robeck, in the *Iron Duke*, wirelessed that we should wait for him. Our small cruiser lay to in a dead calm, under a cloudless sky, within a semi-circuit of the red cliffs of a foreign coast, and the *Iron Duke* came over the horizon to us. She fed us with oil to help us on our voyage, and meantime the Admiral and his Flag Captain Fisher fed me with tea! As we steamed away British sea power seemed to be something very real! Admiral Fisher now returns to the scene of his past activities, this time in supreme command.

I give you the health of our Guests, and ask you to couple with the toast the name of the new Commander-in-Chief in the Mediterranean, Vice-Admiral Sir William Fisher.

Vice-Admiral Sir WILLIAM FISHER, responding for the Guests, said: I wish to reassure you at the outset by saying that I am perfectly well aware that the last man in to bat is not expected to remain at the wickets very long. The idea came to me during dinner, and I would like to commend it to the President for adoption next year, that it would be much more agreeable to everybody if, instead of one person replying for all the guests, a representative from each table should rise and bow and express his own thoughts in his own way. You see what a graceful ceremony it might be: a little sort of *feu de joie* permeating the room; each person paying a tribute to the wit and eloquence of the speakers, returning thanks for the dinner, being grateful for the happy arrangement by which they were placed next to the very people they wished to sit next; and lastly, and I think this will be more important than all, they would say, what I now feel most intensely, how specially grateful they were for being brought into this stimulating and pleasant association with men who plan and carry out great adventures. I think when we are drawn away from all that is trivial and commonplace and brought into contact with such people as we have heard of to-night, we are profoundly grateful for the experience.

I could not help wondering when I heard that Admiral Goodenough had taken over the important post of President of the Royal Geographical Society whether the feelings of the staff at Lowther Lodge were similar to my own when, as the executive officer, second-in-command, I awaited the arrival of the man who is now your President aboard the first battleship which he joined as Captain. Whether they were or not, I am certain the staff came to realize, as I did, what a fund of encouragement, sympathy, and enthusiasm was to follow. I could not help thinking when I listened to the President's most interesting, erudite, geographical exposition that the Navy had, perhaps, receded in his mind. In case any present have a similar impression, let me say that, whatever honours may come to him and have come to him since his active time in the Fleet came to an end, we in the Service hold him in the highest possible regard and admiration for what he did afloat during the Great War. If I wanted to pay the Royal Geographical Society the very greatest honour, I could not do it better than by saying that they chose the one officer of the Navy whom we would like to see as President of the Society.

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Mauritius
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Durban
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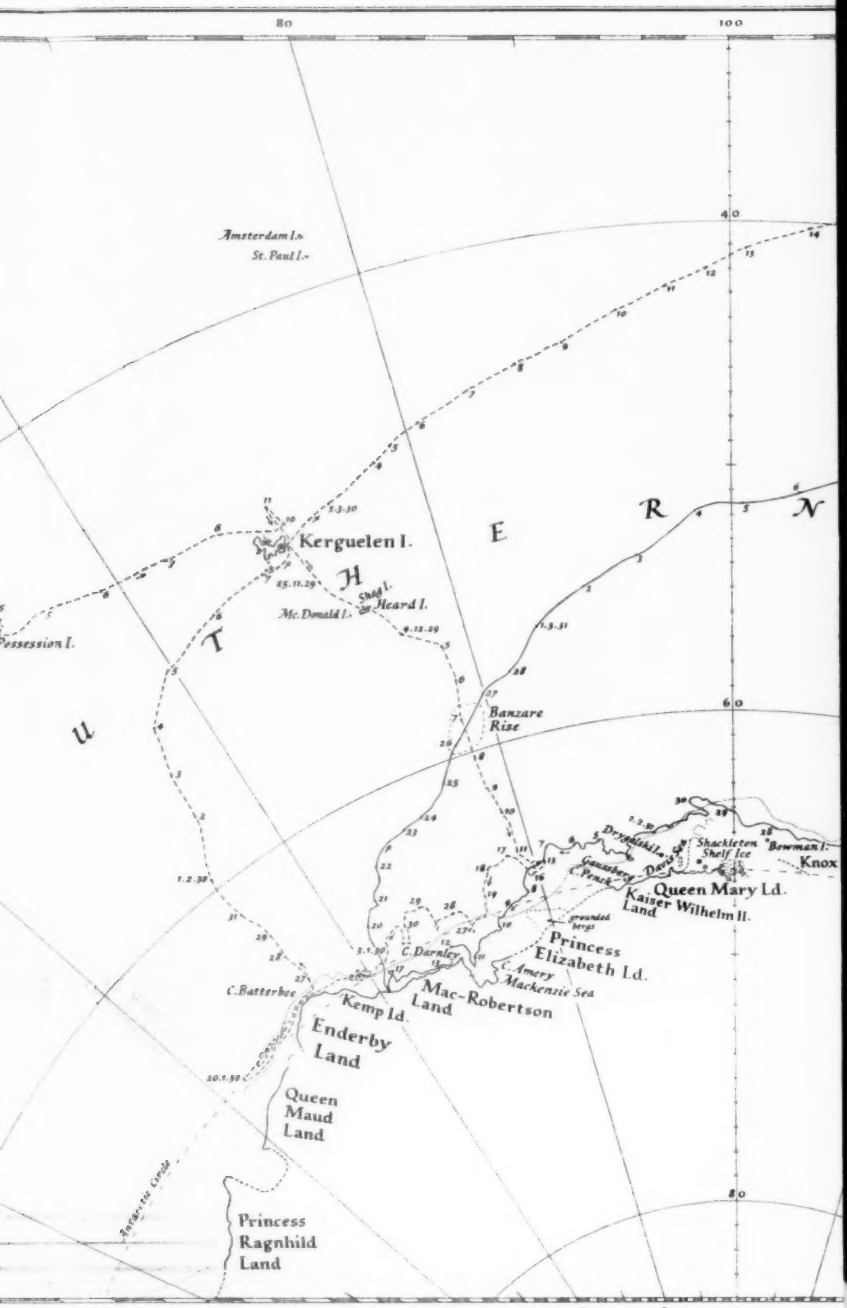
under the command of Sir Douglas Ma



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EALAND ANTARCTIC RESEARCH EXPEDITION fro

awson, O.B.E., D.Sc.

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Brown Pk.
Gould
Nunatak
Douglas Pk
5000
Napier
Ice
Tongue
Tula Range
Mt. Riiser-Larsen
6107
Amundsen
Bay
Mt. Christensen
(approx. 4000)
(ice covered)
Mt. Priestley
Mt. Debenham
Mt. Simpson
Scott Range
Ice covered land
ENDERBY LAND
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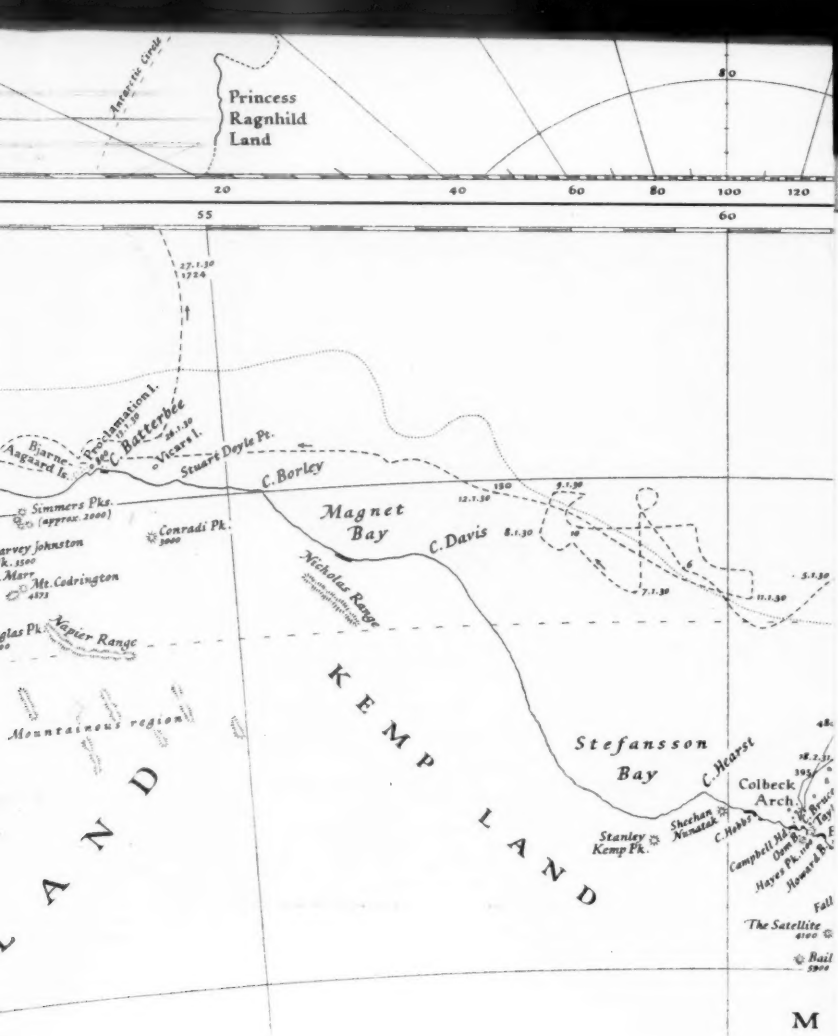

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Track of the "Discovery" 1929-30 ------

" " 1930-31 ——————

1000 fathom line (approx.)

Heights in feet 3350 Soundings in fathoms 480

This chart is from sketch surveys made by the B.A.N.Z.A.R. Expedition during the seasons 1929-30 and 1930-31, adjusted by frequent astronomical observations taken on board the "Discovery," and at Scullin Monolith. The coastline, with the exception of the parts shown in thicker lines, consists of inaccessible ice cliffs, 100 to 150 feet high. Kemp Land west of Cape Hearst was charted from the sea-plane by the 1929-30 expedition and adjusted to coincide with later work. The Mackenzie Sea was charted from the sea-plane at a height of 5,500 feet. Large numbers of icebergs were found at varying distances from the land. The new names on this chart are those proposed by Sir Douglas Mawson.

Published by the Royal Geographical Society

Land
C. Williams
C. North
Sth. Victoria Land
C. Adare
Possession Is.
Scott Is.
ROSS SEA
140
160
180
65
Antarctic Circle
Ryrie Rk.
Kidson I.
Stevenson I.
Douglas Is.
Robinson Group
Lars Andersen I.
Stanton Group
Welch I.
Nielsen Bay
C. Daly
Strahan Gl.
Stevens Rk.
Martin Reef
C. Fletcher
Scullin Monolith
Murray Monolith
Mt. Marsden
Neill Pk.
Mt. Kennedy
Pt. Williams
C. Darnley
Rouse Rks.
Mt. Henderson
Moyes Pk.
Masson Range
Pearce Pk.
Mt. Coates
Mt. Hordern
Mill Pk.
Ice slopes rising to 4000 feet, heavily crevassed near coast
Dingsor Dome
A C - R O B E R T S O N
L A N D
Ice plateau 5000 to 6000 feet
Wright Glacier
Pt. Griggs
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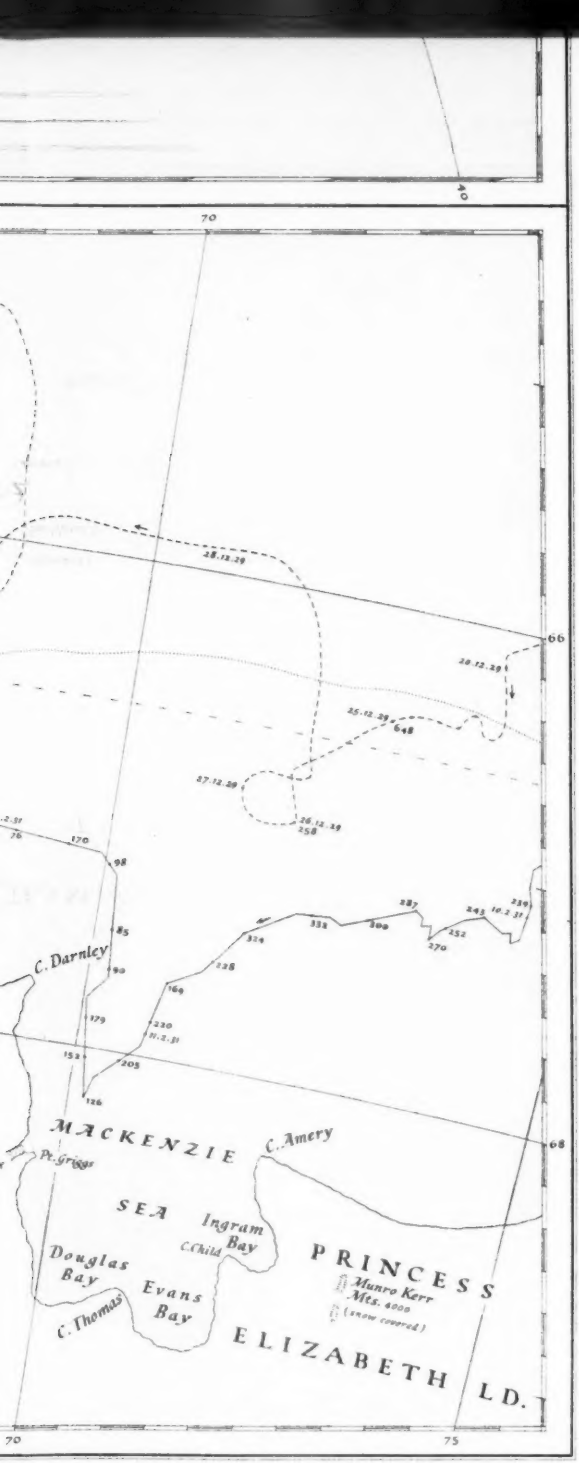
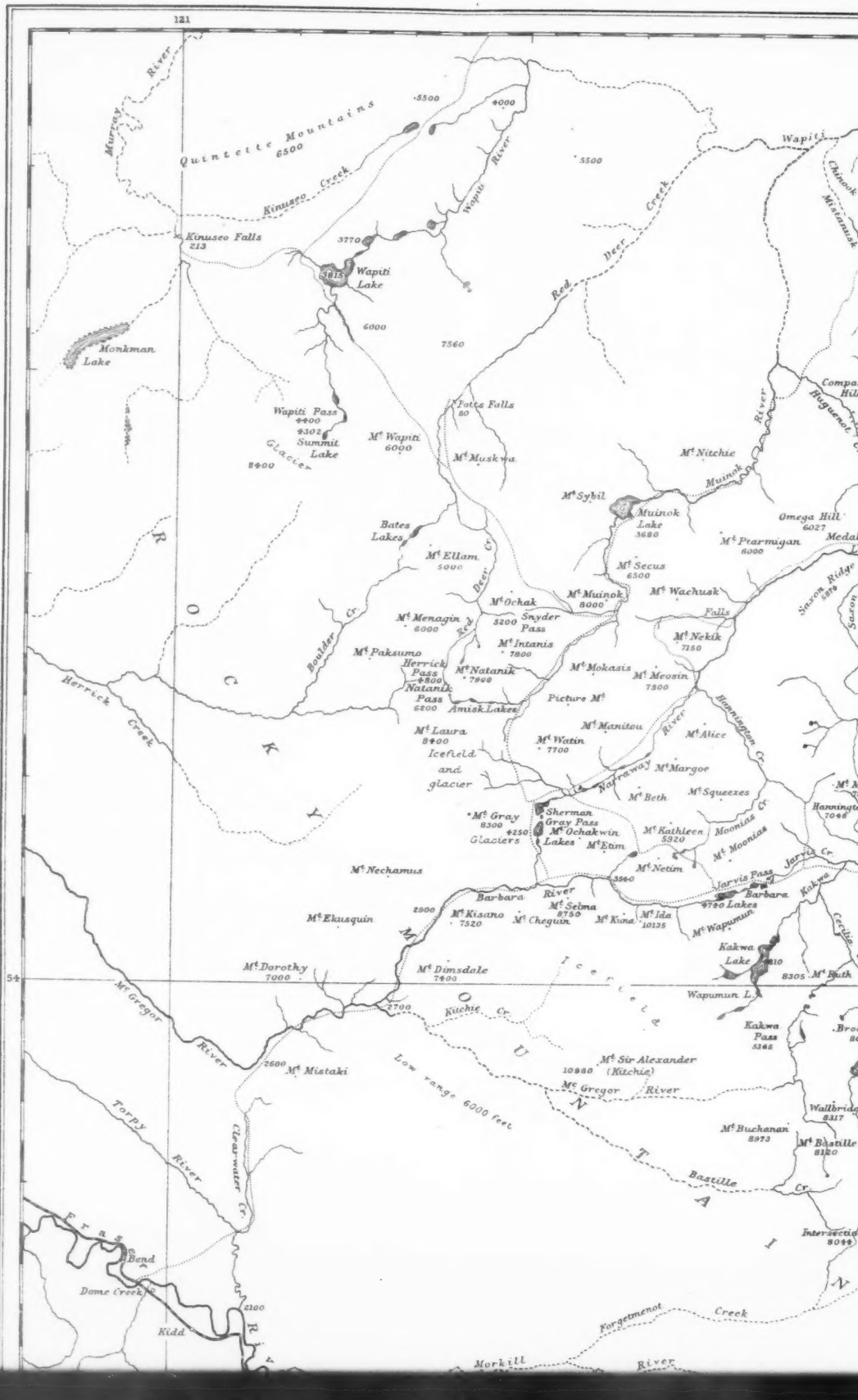
70



ANTARCTIC REGIONS
Mawson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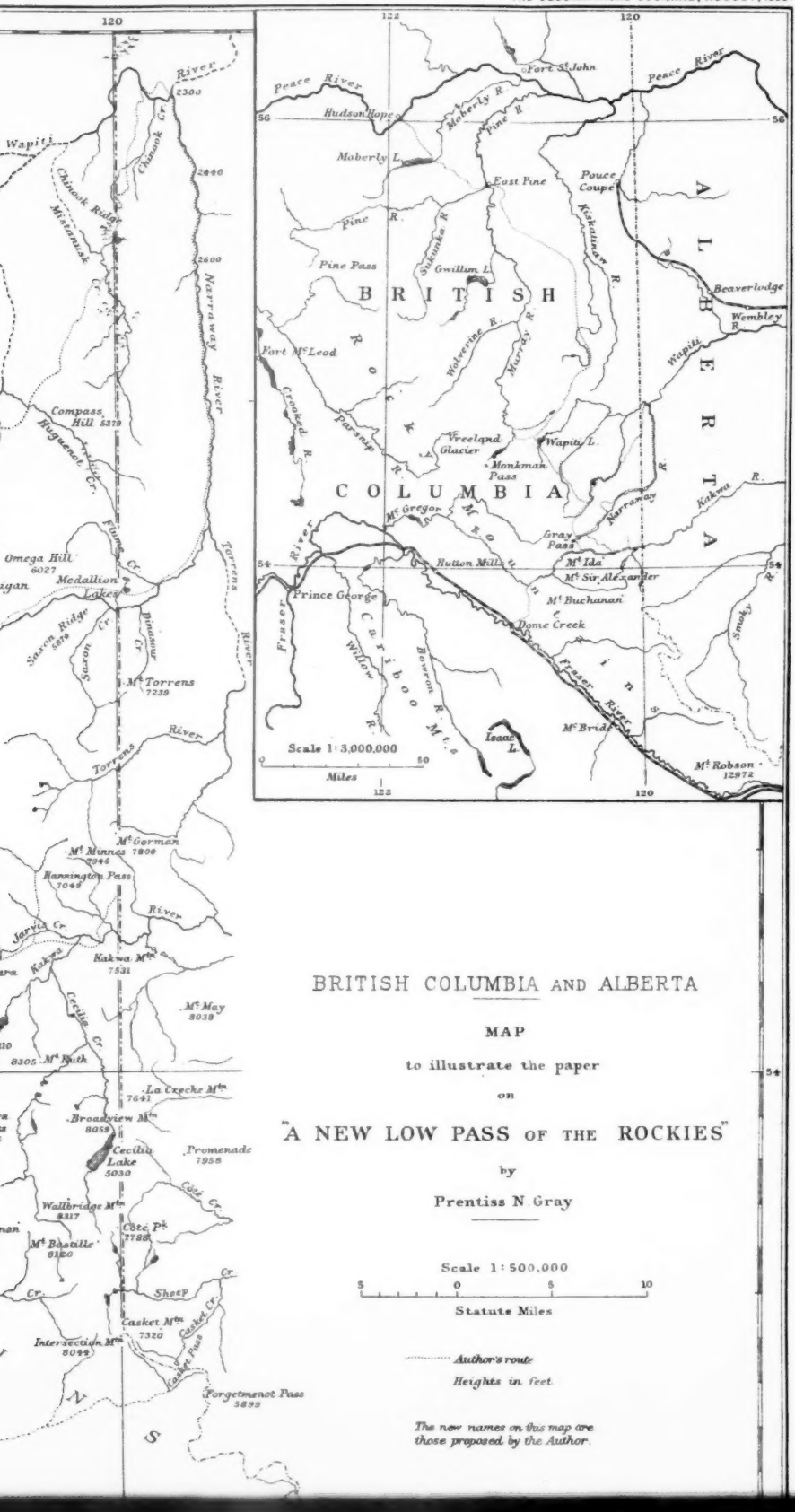
Murray River
Quintette Mountains 6500
Kinuseo Creek
Kinuseo Falls 213
Wapiti River
Red Deer Creek
Wapiti
Chinook
Wapiti Lake
Monkman Lake
Wapiti Pass 4400
Summit Lake
Glacier
Mt Wapiti 6000
Mt Muskwa
Totte Falls
Mt Nitchie
Muinok River
Mt Sybil
Muinok Lake
Omega Hill 6027
Mt Ptarmigan
Bates Lakes
Mt Ellam
Deer Cr
Mt Secus 6500
Mt Ochak
Mt Muinok 8000
Mt Wachusk
Saxon Ridge
Mt Menagin 6000
Snyder Pass
Falls
Mt Nekik 7150
Boulder Cr
Mt Paksumo
Mt Intanis 7800
Herrick Pass 6800
Mt Natanik 7900
Mt Mokasis
Mt Meosin 7300
Natanik Pass 6200
Amisk Lakes
Picture Mt
Herrick Creek
Mt Laura 8400
Mt Watin 7700
Mt Maniteu
Hanington Cr
Mt Alice
Icefield and glacier
Mt Margoe
Mt Beth
Mt Squeezes
Mt Gray 8300
Sherman Gray Pass 4250
Mt Ochakwin
Glaciers
Mt Kathleen 5320
Moonias Cr
Mt Moonias
Mt Etim
Mt Nechamus
Mt Netim 3540
Jarvis Cr
Jarvis Pass
Barbara River
Mt Selma 8750
Barbara 6790 Lakes
Kakwa
Mt Ekausquin
2900
Mt Kisano 7520
Mt Cheguin
Mt Kuna
Mt Ida 10135
Mt Wapumun
Kakwa Lake 8310
8305
Mt Dorothy 7000
Mt Dimsdale 7400
Icefield
Wapumun L
Mt Gregor River
2700
Kitchie Cr
Kakwa Pass 5182
Mt Sir Alexander (Kitchie) 10980
Mt Gregor River
2600
Mt Mistaki
Low range 6000 feet
Wallbridge 8317
Mt Buchanan 8973
Mt Bastille 8120
Toppy River
Clearwater Cr
Bastille Cr
Intersection 8044
Dome Creek
2100
Kidd
Forgetmenot Creek
Morkill River



BRITISH COLUMBIA AND ALBERTA

MAP

to illustrate the paper

on

"A NEW LOW PASS OF THE ROCKIES"

by

Prentiss N. Gray

Scale 1:500,000

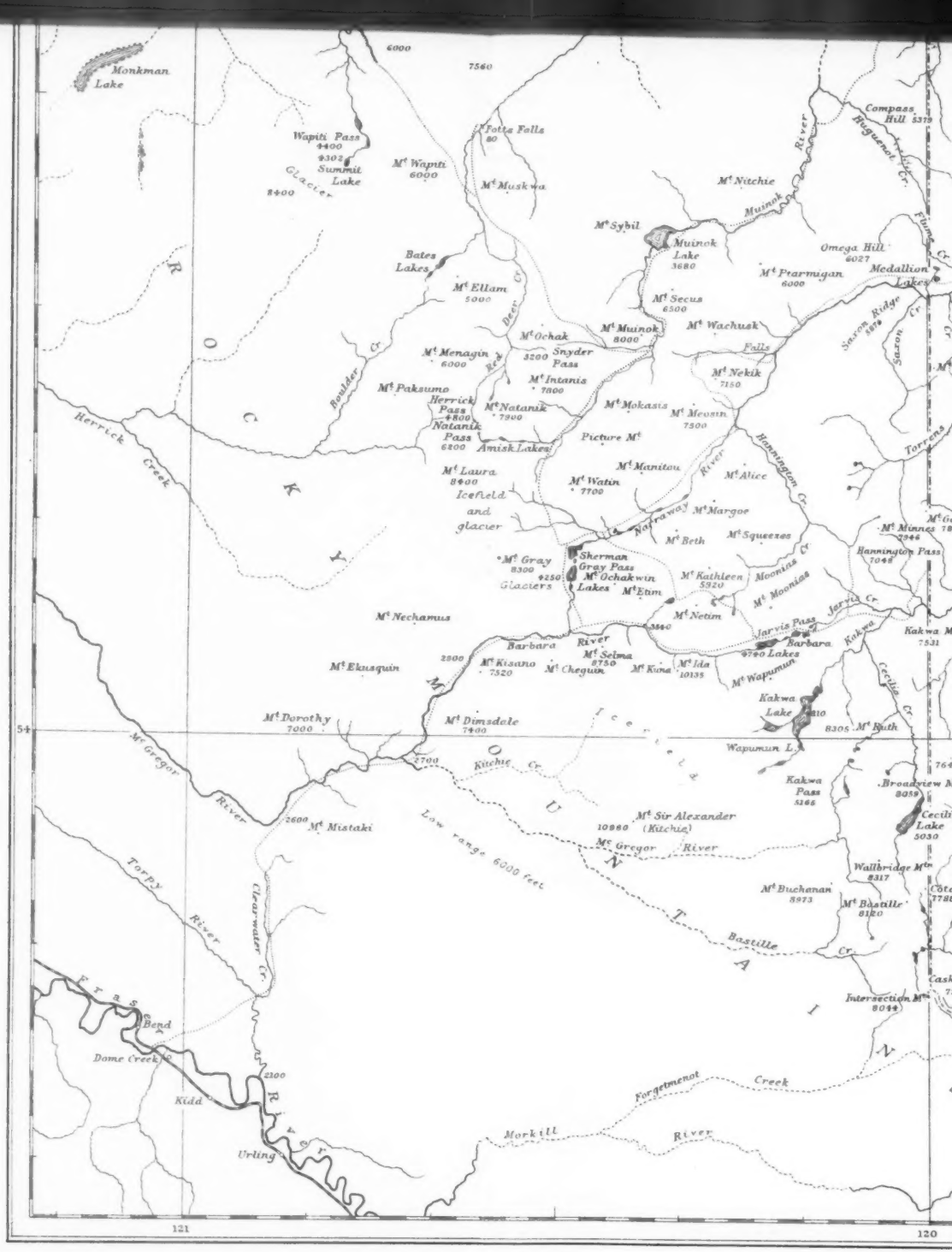
5 0 5 10

Statute Miles

..... Author's route

Heights in feet

The new names on this map are those proposed by the Author.



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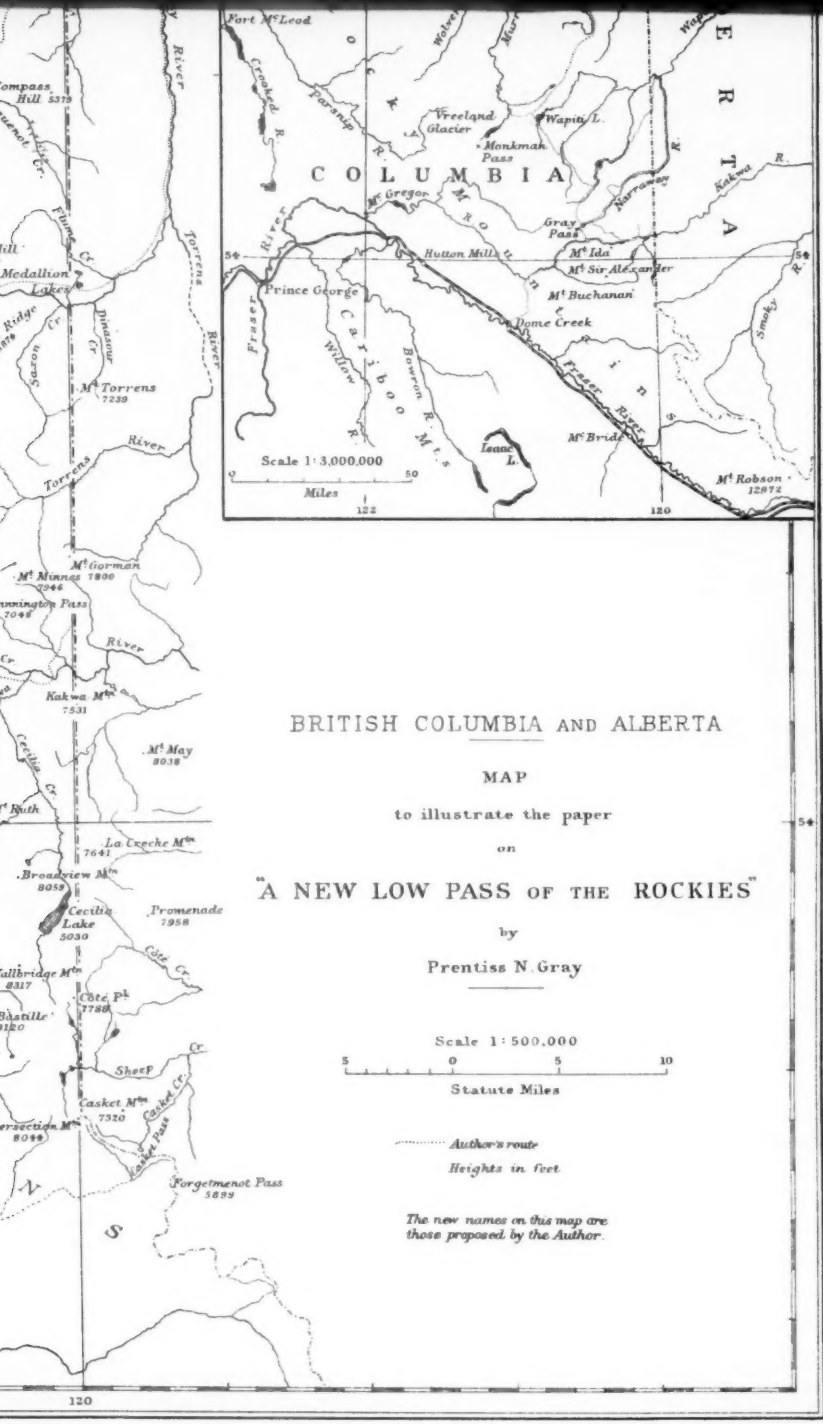

BRITISH COLUMBIA AND ALBERTA

MAP

to illustrate the paper

on

"A NEW LOW PASS OF THE ROCKIES"

by

Prentiss N. Gray

Scale 1:500,000

5 0 5 10

Statute Miles

..... Author's route

Heights in feet

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